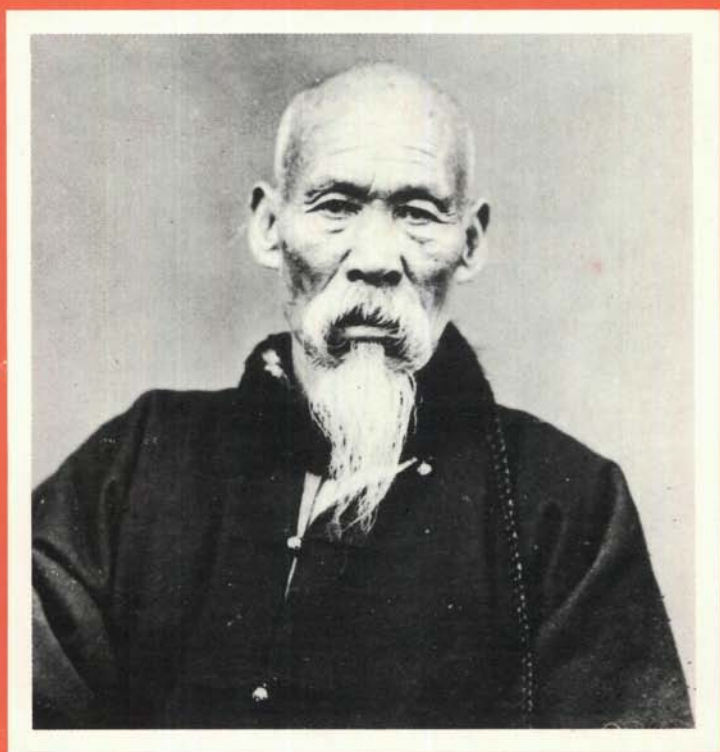


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ESSAYS ON GERMANIC RELIGION

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Some Comments on *Völuspá*, Stanzas 17-18
Divine Names in Indo-European
Germanic Religion: An Introduction
Postscript

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EDUCATIONAL REFORM IN MAINLAND CHINA

Dr. Diane D. Pikcunas
National College of Education

Deng Xiaoping made reform of the educational system in the People's Republic of China a major goal in his post-Maoist economic reform program entitled the "Four Modernizations", which included modernization of agriculture, industry, defense and science and technology.¹ Education reform would advance his goal of making the PRC a major world economic power in the early part of the 21st Century. The enormity of the task became evident when after ten years of reform, including major efforts in the educational system, Deng Xiaoping confided to the leader of Uganda, Yoweri Museveni, during a visit by the latter to Beijing: "Our biggest mistake in the last ten years has been that education has not developed sufficiently."² What has happened to the education reform program which had promised so much for the development of China?

The Traditional System

Education has always played a major role in Chinese history, notably in "imperial China" where learning and the scholar gentry enjoyed great respect and prestige. The famous "Hundred Schools of Thought" represented a period in ancient China when scholars gathered students to teach them. The philosophy espoused by Master K'ung or Confucius (his latinized name) became dominant. Confucius taught the importance of upright character and the spreading of knowledge to all classes and groups in society as well as proper relations to bring harmony to home and society.³

1. For a discussion of China's modernization program see Donald J. Senese, *Sweet and Sour Capitalism: An Analysis of 'Socialism with Chinese Characteristics'*, Washington, D. C.: Council for Social and Economic Studies, 19.

2. Sheryl WuDunn, "China's Intense Love of Education Cools Off," *The New York Times*, April 9, 1989, p. 18.

3. Franz Michael, *China Through the Ages: History of a Civilization*, Boulder and London:

The Chinese Emperors established a system of examinations for the selection of government officials strongly emphasizing a knowledge of Chinese classics and history. The scholar gentry conducted China's government for thousands of years and were expected to be among the best and the brightest — a system producing scholars supportive of orthodoxy in thought. Some of the Emperors in Chinese history distinguished themselves as scholars, notably in artistic and literary fields.

The Chinese Revolution of 1911, which overthrew the imperial system, brought Western scholars to China to introduce a new leadership class with a heavy emphasis on science, technology, and pragmatic thought. A heritage of education had been given by missionaries but the new group of educators (such as John Dewey) sought to adjust Chinese society and civilization to the prevailing currents of Western thought. The president of the new Republic of China, Dr. Sun Yat-sen, himself familiar with Western thought, sponsored modernization through his "Three Principles of the People," an updating of Confucianism blended with new Western intellectual concepts. The "Chinese Renaissance" led by such scholars as Hu Shih encouraged a new wave of educational development in twentieth century China.

The triumph of Mao Zedong and the Chinese Communists brought even more dramatic change. The focus of education would seek the creation of a "new man" and a "new society" based on Marxism-Leninism-and-Thought of Mao Zedong. The educational system would undergo a major change for its adaption to the "New China." Contact was cutoff with Western powers and the Russian model became dominant, as Stalin had aided Mao in his conquest and the Soviet Union had a thirty-year head start for their process of communization.

Education in China became vital to the process in both "socialist revolution" and "socialist construction" in building the new Communist man and the new Communist state. There existed then, as it does today, a conscious concern with the

ideological and moral content of education, an intention to uproot old ideas and nurtures new virtues in accord with the ideology and ideals of the new regime.⁴

But the Chinese Communist educational system established after the revolution in 1949 (termed by the PRC officials the "Liberation") went beyond the basic requirements of other societies and required a commitment to Mao Zedong and the Chinese Communist Party, even to the point of the deification of Mao (the "Cult of Personality") The educational system objective became twofold: development of a specific level of expertise for the modernization of China and a strong personal commitment to Mao. "Moral education" in the Chinese context does not represent merely public virtue but actually "political education" (e.g., socialist and communist education, class education, labor education). Education in the PRC consisted of more than promoting a positive attitude toward the political system; the whole system fit in a design of having the total population share Mao's vision for China under the leadership of the Chinese Communist Party. In Mao's view, political education stood higher and remained of greater importance than the spreading of knowledge. The goal of education focused on developing citizens both "red" and "expert."⁵ Methods may have changed but the goal has remained the same. An official publication of the PRC government during the mid-point in Deng's reign described the process for the educational system as follows:

College students in China today want to be, in Chinese terminology, "red and expert." ... "Red" refers to the political criterion; "expert," the vocational level. Loving one's socialist motherland, working consciously for socialism and serving the people, is "red." Anyone who holds to socialism politically, works hard to do a

4. Charles Price Ridley, Paul H.B. Godwin, and Dennis J. Doolin, *The Making of a Model Citizen in Communist China*, Stanford, California: The Hoover Institution Press, 1971, pp. 24-25, 101. This study is based on a content analysis of ten basic Readers used in the first five grades of the PRC with a focus on how the PRC educational system helps to mold what the regime considers "model citizens."

5. *Ibid.*, pp. 5-8, 23.

good job and to continually improve his work and makes contributions to society is considered "red and expert."⁶

As an educator, I feel compelled to stress one major point: the educational system in the PRC plays a more central role in Chinese society than does the comparable educational system plays in such countries as the United States or the United Kingdom. Educational systems reveal to us the values that the dominant forces in society regard as important enough to keep alive for coming generations. This factor is especially true in China as it seeks to destroy the past, create a new history, and mold a new type of individual. Ruth Gamberg, who conducted an extensive study of the Chinese system, has stated it well:

In the case of China more specifically, because education is so pervasive, affecting in a very central way the lives of adults as well as children, and because the activities that go on inside of school buildings are linked directly with those outside, a look at education can teach us a great deal about how the society as a whole operates. Moreover, China's educational system is based on a completely different set of assumptions that derive from a completely different world outlook from ours.⁷

Effects of the Cultural Revolution

The PRC's educational development is divided into three basic periods: from 1949 (Liberation) to about 1966; the period of the Cultural Revolution, 1966-1976; and the post-Cultural Revolution or Deng's rule, 1976 or 1978 to the present. To understand the change and current developments in the educational system, a short political history is necessary to give us the context of the recent educational developments.

Mao Zedong is one of the world leaders who dominated forces for change in China for over half a century. Mao led the

6. *China Today: A Nation at School*, Beijing: Beijing Review Pubs., 1983, pp. 37, 39.

7. Ruth Gamberg, *Red and Expert: Education in the People's Republic of China*, New York: Schocken Books, 1977, p. 8.

Chinese Communist Party during the long civil war with the Nationalist Chinese in the 1920s, 1930s and 1940s (*e.g.*, Mao had been one of the founding members of the CCP in 1921 in Shanghai). The Communist triumph took place on October 1, 1949 and Mao ruled China with an iron hand from that time to his death in September of 1976. The latter years of Mao's regime plunged China into a chaotic period known as the Proletarian Cultural Revolution.

Mao wished to give the young people of China a revolutionary experience so that the next generation would avoid the mistakes that his Soviet brethren had fallen into — "revisionism" and a sympathy with capitalism which had diminished their revolutionary fervor. (This divergence in views led to an alienation between the world's largest two Communist nations, the Sino-Soviet split of the 1960s). He launched the Red Guards who vigorously attacked any symbols of the old system, seeking to stamp out China's past (*e.g.*, Confucian temples were destroyed) and led attacks on teachers, parents, and others, members and non-members of the Chinese Communist Party. Consolidating his control, Mao used the army to restore order but this 'decade of destruction' lasted from 1966 to 1976.⁸ Besides the economic and political

8. The Cultural Revolution as it affected the Communist Party governance of China is treated in Stephan Uhalley, Jr., *A History of the Chinese Communist Party*, Stanford, California: Hoover Institution Press, 1988, and Laszlo Ladany, *The Communist Party of China and Marxism 1921-1985: A Self-Portrait*, Stanford, California: Hoover Institution Press, 1988. For a more personal view of the effect of the Cultural Revolution on individuals especially intellectual, see Nien Cheng, *Life and Death in Shanghai*, New York: Grove Press, 1986, and Anne F. Thurston, *Enemies of the People: The Ordeal of the Intellectuals in China's Great Cultural Revolution*, New York: Alfred A. Knopf, 1987. For related material, consult Peter Troiano, "The Witness from Shanghai," *Philip Morris Magazine* (May-June, 1989), pp. 28-31; Donald J. Senese, "China's Cultural Catastrophe: Commentary on *Enemies of the People*," *The World and I*, (June, 1987, PP. 387-395; and Thomas W. Robinson (editor), *The Cultural Revolution in China*, Berkeley: University of California Press, 1971. In May of 1984, a study team of Americans, funded by the Office of Educational Research and Improvement in the U.S. Education Department visited China. A member of that delegation, Dean of the Graduate School of Education at Rutgers University, Irene Athey, observed: "For, despite its name, the Cultural Revolution was anti-intellectual and anti-educational. ... Hence, a large cohort of students lost a vital ten years of their education, a fact of which they are painfully aware. This realization was brought home to use when the delegation visited the Qianjiang

chaos brought to China, the movement dealt a major blow to the educational system of China where schools at all levels were closed. Millions of Chinese were sent to the countryside for training while others were brought from the countryside to urban areas. Even when some schools were reopened academic standards were abandoned.

Deng Xiaoping emerged as the new leader of post-Mao China.⁹ He had been a longtime Communist Party member and had been a pupil of Mao's longtime associate, Zhou Enlai (Premier and Foreign Minister of the PRC), who died in early 1976. Deng had been purged during the Cultural Revolution and he failed even to succeed his mentor Zhou. He now reestablished himself in power in an amazing comeback. He recognized the fallacy of Mao's "go it alone" policy for China and the failures in the economic realm, as well as the educational field. Deng realized China needed outside help for its full development and launched the "Four Modernizations." While not listed as one of the four, the improvement of education was essential if modernization would be successful in China. A restoration of the educational system — and enlisting it in the modernization drive — became essential.

The type of education China needed had become a casualty of the Proletarian Cultural Revolution. The examination system fell out of favor for college enrollment; it had been suspended between 1966 and 1976, and came to a complete stop between 1966 and 1971. The resumption in 1972 focused on enrolling workers, peasants, and soldiers (of equivalent to junior middle school graduate). The cancellation of examinations prevented an effective testing for qualified candidates; political recommendations for education became

Adult College in Hangzhou, where we were highly impressed by the ability and enthusiasm of the students and the caliber of the questions they posed to us. When we remarked on this fact, the principal responded that many of the students were trying to make up for lost time." June Y. Mei (editor), *Reading in China*, Report of the U.S. Study Team to the People's Republic of China, New York: National Committee on U.S.-China Relations, 1984.

9. Immanuel C. Y. Hsu, *China Without Mao: The Search for a New Order*, Oxford: Oxford University Press, 1982, pp. 12-25, 29-32.

prevalent. China suffered a "lost generation" because of these educational policies. Even the PRC's official documents admit that fraud became "a common occurrence," the level of new students and of education "drastically deteriorated," and the "cause of education and talented training" suffered "a serious set-back."¹⁰

The commentary of Feng Youlan, professor of philosophy at Beijing University and known as one of twentieth century China's foremost philosophers and historian of Chinese philosophy, is worth considering. He described the effect of the Cultural Revolution on learning in the 1984 publication of his memoirs, *The Hall of Three Pines: A Preface*. He wrote that once intellectual development and putting learning first came under criticism, "learning first" became "learning last" and the more knowledge one had, the more reactionary a person was considered.¹¹

Launching educational reform

On April 22, 1978, Deng Xiaoping called for major educational reforms in his address to China's National Conference on Education, a speech which officially launched China's efforts to upgrade education.

Deng criticized the approach to education which had taken place under the widow of Mao Zedong, Jiang Qing and her supporters, the "Gang of Four." He charged them with opposing students studying science, social sciences, and humanities in their effort to place "intellectual education first" and thus divorcing education "from proletarian politics." He attacked their assertion that in effect the more a person knew, the more reactionary that person would become (*e.g.*, "bourgeoisie intellectuals").¹²

10. "A Brief Introduction of Higher School Enrollment Examinations in China," Beijing: The State Education Commission of the PRC, 1986, p. 6.

11. Feng Youlan, "Beijing University," Chapter 8 of *The Hall of Three Pines: A Preface* (Beijing: Sanlian Shudian, 1984), reprinted in *Chinese Education: A Journal of Translations*, Vol. XXI (Winter, 1988-89), No. 4, pp. 76, 87.

12. Deng Xiaoping, "Speech at the National Conference on Education," April 22, 1978, *Selected Works of Deng Xiaoping (1975-1982)*, Beijing: Foreign Languages Press, 1984, p.

Deng, however, did not reject "political education" (in fact, he strongly endorsed it) but asserted that academic education and political education did not constitute an either/or proposition. Students "must indeed give top priority to a firm and correct political orientation" but that this did not mean they should "devote a great many classroom hours to ideological and political teaching" nor did it mean they should abandon the study of sciences, social sciences, and humanities. Deng, on the other hand, believed that the higher the student's political consciousness, the more the student would apply himself to the study of academic subjects "for the sake of the revolution."¹³ He urged the strengthening of "revolutionary order and discipline" in the schools so that the new generation be brought up with "socialist consciousness" and thus can "help to revolutionize the moral tone of society."¹⁴

Deng favored a thorough examination for all applicants (e.g., intellectual as well as moral qualities) with admission to the secondary schools and institutions of higher education going to the best qualified. He linked the goal of the educational system directly with economic modernization. And he specifically favored designing ways of combining education with productive labor.¹⁵

Even the Chinese bureaucracy moves slowly. The initiation of this program came with the adoption by the Central Committee of the Communist Party of China (May 27, 1985)

119. The speech may also be found in Robert Maxwell (General Editor), *Deng Xiaoping: Speeches and Writings*, New York: Pergamon Press, 1984, pp. 54-61.

13. *Ibid.*, p. 120. Deng charged: "Hence the Gang of Four were not only being utterly ridiculous but were actively negating and betraying proletarian politics when they opposed efforts to improve the quality of education and to raise the students' scientific and cultural level on the basis of a firm, correct political orientation and declared that was 'putting intellectual education first.' *Ibid.*

14. *Ibid.* Deng supported political education throughout the Chinese educational system especially for the very young: "The responsibility for training young successors for the revolutionary cause rests particularly heavily on the primary and secondary school teachers and on kindergarten personnel. We should strive to inculcate in our young people the revolutionary style of diligent study, observance of discipline, love of labor, pleasure in helping others, defiance of hardships and courage in the face of the enemy." *Ibid.*, p. 127

15. *Ibid.*, pp. 123-126.

of a document outlining a reform of the educational structure. The document clearly stated that for the success of the modernization program a vital factor "lies in the availability of skilled people, which requires the vigorous development of education as economic growth allows."¹⁶

The document addressed itself first of all to removing obstacles to educational reform. A commitment was made to streamlining administration (*e.g.*, devolving power on local governing units for decision-making in the schools), reform the labor and personnel system, and make adjustments in course content and teaching methods in the service of economic modernization. Recognition was given to the necessity for increased funds. The overall thrust would include significantly strengthening elementary education, greatly expanding vocational and technical education, and adapting the colleges and universities toward training personnel China needed in science and technology.¹⁷ Addressing the problems of higher education, the document stressed the necessity to "change the irrational distribution of disciplines" offered by institutions of higher education. Weak departments in colleges and universities needed strengthening and certain specialties needed development (*e.g.*, finance, economics, political science and law, management). Examinations were reestablished and reform proposed for the system of automatic job assignments for graduates by the government. In the latter case, schools should be brought into greater participation in such arrangements.¹⁸

The conditions of teachers had to be improved — better pay, elevated prestige, and a larger role in decision-making in education. While academic content relating to modernization received new emphasis, the role of ideological and political workers would still remain paramount.¹⁹ Compulsory education for nine years would be required throughout the country

16. "Decision of the Central Committee of the Communist Party of China on the Reform of the Educational Structure (May 27, 1985)," Beijing: Foreign Languages Press, 1984, p. 1.

17. *Ibid.*, pp. 4-5, 13.

18. *Ibid.*, pp. 14-18.

19. *Ibid.*, p. 20.

but this reform would be phased in.²⁰

The move toward a lessening of central control and strengthening of other local groups in decision-making, including shifting some of the burden of financing away from the central government, brought an administrative restructuring of education within the PRC — the creation of a State Commission of Education.²¹

In June of 1985, the creation of the announced State Education Commission was announced at the same time the Ministry of Education was abolished. The creation of a state council handling education elevated the role of education and gave it greater visibility as a priority of the PRC government. The State Education Commission assumed functions which had been previously exercised by the Ministry of Education and the State Planning Commission; its role focused on coordinating education policy and assumed charge of all education organizations (except military ones). The mandate of the new State Education Commission including formulating guiding principles for education, establishing regulation, planning the progress of educational projects, coordinating the educational programs of different departments, and standardizing educational reforms. As referred to earlier, the statement adopted by the CCP focused on a devolution of management to provinces (*e.g.*, Kansu), autonomous regions (*e.g.*, Tibet) and special municipalities (*e.g.*, Beijing, Shanghai). These governmental units gained greater decision-making power, a greater role for financing education, and responsibility for developing basic education.²²

Structure of the educational system

The educational system in China is structured along a 6-3-3-4 pattern. The primary schooling is 6 years with 3 years

20. *Ibid.*, pp. 6-7.

21. *Ibid.*, p. 18.

22. Robert L. Worden, Andrea Matles Savada, and Ronald E. Dolan, *China: A Country Study*, Washington, D.C.: Department of the Army, U.S. Government Printing Office, 1988, p. 157.

of junior middle school, 3 years of senior middle school, and 4 years for high schools. During the Cultural Revolution, this schooling system had been shortened about 4 to 5 years with students performing two years of work in the countryside before they would be considered for higher education; the present system was restored in the 1970s after the fall of the "Gang of Four" and resembles the pre-Cultural Revolution educational system. Pre-primary schools exist for the large number of women with young children who work; these are usually attached to a place of work and care for children between 18 months and 3 years of age. Kindergartens care for children from 3 to 6 years of age and are coordinated by local bureaus of education, communes, or factories. Higher education is four years and generally follows the Soviet model of having a small number of very comprehensive universities which offer a broad curriculum of social sciences, arts, and pure sciences; polytechnic institutes which offer a wide range of applied sciences; and specialized instruction giving training in such fields as medicine, engineering and teacher training. Graduate education was reorganized after 1978 (after being halted during the Cultural Revolution) and a growing number of graduate students are studying outside of China, notably in Western countries such as the United States.

Teacher training is also a major task and three levels are offered: higher teacher training offer a 4 year program for teacher training senior middle graduates to teach in senior middle schools; 2 year training schools for training senior middle graduates to teach in junior middle schools; and secondary teacher training schools with a 3 year program for training junior middle school graduates for teaching in primary schools or kindergartens. In-service training has been stressed for upgrading the teaching profession.

China also has a large number of spare time schools, of varying quality, conducted by factories, farms and other enterprises geared to raising the knowledge of workers on the job. Television universities educate those who have not been able to enter the regular university system. Self-study programs are offered by libraries.

In the overall system the polytechnic institutions and colleges have been linked as major elements for China's scientific and technological development. Alternative higher education institutions include commune and factory ones (peasant and worker colleges), which have the task of training agrotechnicians and industrial technicians.²³

A dominant thread throughout the educational system is the role of the Chinese Communist Party. An examination of the Chinese educational system would be incomplete without understanding its role. The CCP has branches that exist at every level from the top levels down to the bottom levels of education. The Party officials have the responsibility for the political education of administrators, teachers, and students and oversee that Communist Party guidelines for education are followed. There is little controversy over the core or ideological foundation of Chinese education, but notably over the structure of education which organizational approach will best serve the fundamental ideological goals of the Chinese Communist Party.²⁴

23. "China," *International Handbook of Education Systems*, New York: John Wiley & Sons, 1984, Volume III: Asia, Australia, and Latin America, pp. 111-112, 115-117; John N. Hawkins, "China, People's Republic of," *The International Encyclopedia of Higher Education*, San Francisco: Jossey-Bass Publishers, 1977, Volume 3, pp. 892-893.

24. *International Handbook of Education Systems*, p. 121; Mikel G. Edwards and Yueping Sun, "China," *World Education Encyclopedia*, New York: Facts on File Publication, 1988. The authors note that the educational approach of the PRC can be summed up "as the all-important question: Which educational methods best serve the leadership's goal of creating a communist China with a developed country?" *Ibid.* A useful bibliography is included on pp. 228-237. See also Ralph C. Crozier, "Education and Culture," in Harold C. Hinton (editor), *The People's Republic of China: A Handbook*, Boulder, Colorado: Westview Press, 1974. For the official view of the PRC educational system see the annual editions of the *People's Republic of China Yearbook*, Beijing: Xinhua Publishing House; *A Nation at School: China Today*, Beijing: Beijing Review Publications, 1983; and "Education," *Information China*, Oxford and New York: Pergamon Press, 1989, Volume 3, pp. 933-982. For contrasting views of the four decades of development of the PRC system see Hsin-han Liu, "Educational Development in Communist China During Last Four Decades," paper presented to the Seventeenth Sino-American Conference on Mainland China, June 5-11, 1988, Institute of International Relations, National Chengchi University, Taipei, Taiwan, Republic of China. A very favorable view of accomplishments can be found in Zhixin Su, "'People's Education' in the People's Republic of China," *Phi Delta Kappan*, (April, 1989), pp. 615-618. Zhixin Su approaches his

Assessing Educational Achievement

Serious problems remain at all levels of Chinese education and give credence to Deng Xiaoping's comments to Uganda's leader cited earlier. During the past decade, China's number of colleges and universities have almost doubled in number. Student enrollment is up by 78 percent with an expansion of 87 percent for faculty. New facilities have been built at the colleges and universities — computer centers, new laboratories, libraries, and classrooms. And following the admonition in 1985 of the need for new funds, funding for education has been increased — from 1.8 percent of the PRC's Gross National Product in 1975 to 2.9 percent in 1985.²⁵

The overall result has been dismal compared to the promises made by the PRC's leaders and the needs of China. China has along way to go if it is to catch up with other nations of the world, even with other nations in Asia, for school enrollment. The World Bank's 1986 report *China: Management and Finance of Higher Education* concluded that if the PRC was to reach the median level of higher education of developing countries as a whole by the year 2000, China's university enrollment needed to expand by 12 percent annually.²⁶ For example, China enrolls 168 students per 100,000 compared to South Korea's 3,672 per 100,000.²⁷

The situation in China has become serious enough to label it as an educational crisis. The problems which appear most frequent include: a deficient educational administration; inadequate education equipment; low pay for teachers; lack of attention to educational issues by local governments; diversion of funds from educational projects to other uses (*e.g.*, construction of high-rise apartment buildings) by Communist Party

analysis from a Marxist-Maoist perspective: "The Modern Chinese system of education is known in China as 'people's education.' That phrase is used to distinguish the semifeudal, semicolonial system of education for the privileged few in old China from the socialist system of education for all the people in New China (after the establishment of the People's Republic of China in 1949)." *Ibid.*, p. 615.

25. Todd M. Johnson, "The Economics of Higher Education Reform in China," *China Exchange News*, Vol. 17 (March, 1989), No. 1, pp. 3-4.

26. *Ibid.*, p. 3.

27. *Ibid.*, p. 4. Figures are from *Unesco: Statistical Yearbook*, by the United Nations.

officials and government workers; and a shift to commercial activities by students who are encouraged by parents to drop out of school. The latter situation has occurred when parents have encouraged dropouts to open small retail shops and encouraging a social condition labeled as "caring more for money than knowledge."²⁸

The conditions I witnessed in the schools I visited were meager to primitive and I am sure that our delegation of educators were shown the better schools. One can realize the seriousness of the situation by the fact that according to official figures of the PRC 90 percent of the primary schools and 60 percent of the junior high schools lack proper buildings and books. Children trudge long hours for classrooms in dilapidated shacks. They learn from teachers with barely a high school degree. In Beijing, some students share ragged books and in some schools, the children must bring their own chairs to school. In the rural areas, children attend schools in converted Buddhist temples or abandoned buildings. Of the children enrolled in primary schools, one-third do not continue on to junior high school; high school enrollment has plunged by 27 percent during the last decade.²⁹ The assessment made by Marianne Bastid in 1984 appears still valid:

School buildings and dormitories everywhere are inadequate for the present student and teacher population. Shortage of space accounts for the very common use of a double-shift system in secondary schools and in some universities and colleges. Facilities are poor. Lighting and heating are always inadequate. Many rural schools lack window-panes and even basic furniture. After classes, neither students nor teachers can find an environment conducive to effective study. Any increase in school population as proposed by

28. "A Correct View of the Crisis That Lies Ahead for Chinese Education," *Ta Kung Pao* editorial, Hong Kong, January 13, 1989, reprinted in *Inside China Mainland*, Volume 11 (March, 1989), No. 3, Issue No. 123, p. 1.

29. WuDunn, "China's Intense Love of Education Cools Off," p. 18.

government plans at the primary and university levels is likely simply to worsen the negative effects of these difficult conditions.³⁰

Even after more than a decade, the educational system of China, tied into the modernization program, has not been turning out nearly enough people adequately trained to enter a modern industrial labor force nor to contribute productively to it. The percentage of lower secondary school graduates who enter the labor market with little or no job training is on the increase. As mentioned earlier, the dropout rate is a problem where classes may be losing 9 percent of their students between each grade. The dropout rate is even more serious in the rural areas. And the declining school attendance is affecting China's efforts toward universal literacy, an important quality for economic modernization.³¹

Higher education problems remain

Although the university system seems the one area so far immune to retrogression in the educational system, serious problems remain even at this level.

A problem still needs resolving is the placing of university graduates. While the U.S. graduates have the opportunity to move away and take any job offered, the PRC government has made it a practice to assign students jobs where the government feels they are needed. Thus, the universities which have trained them and understand the student's talents cannot place them and employers cannot choose the students they employ. The students have been caught in the dilemma between the employment a university education guarantees (*e.g.*, the "iron rice bowl") and having little voice in the type of job and

30. Marianne Bastid, "Chinese Educational Policies in the 1980 and Economic Development," *The China Quarterly*, Volume 98 (June, 1984), p. 200.

31. James T. Myers and Donald J. Puchala, "Some Demographic Constraints on Chinese Economic Modernization," Paper presented to the Seventeenth Sino-American Conference on Mainland China, June 5-11, 1988, Institute of International Relations, National Chenchi University, Taipei, Taiwan, Republic of China, pp. 30-32.

location in which they will be placed in after graduation.³²

A major shift in the education reform program of 1985 for higher education included a shift in funding responsibility – from the central government to universities, as well as to the recipients of education (*e.g.*, students, families, and work units). However, the costs of expanding the higher educational system have proved expensive and the funds insufficient. For example, central government financing for Beijing University and People's University represents only about two-thirds of their budgets and the universities have been running deficits, some running into the millions of yuan (Chinese economic unit). As a result, some of the universities have had to devote time and energy to non-academic pursuits such as money-making in order to supplement their state budgets. Liberal arts universities have offered courses for government and business, and the science and technology universities have resorted to selling a variety of goods and services (*e.g.*, technical equipment, chemicals).³³ Two major incidents at the end of 1988 and the beginning of 1989 illustrate growing problems in the universities: racial clashes with foreign students and the prodemocracy demonstrations.

China opened the doors of its educational system in the 1970s and an estimated 7,000 foreign students from 110 countries are studying there. The PRC has over the years used foreign students as an extension of its foreign policy. African and Third World students constituted the vast majority of foreign students in China in the 1970s but presently constitute only about one quarter of the total (1,500 students); these

32. Yu Yueqing, "Beijing University: China's Highest Institution of Higher Learning," *Chinese Education: A Journal of Translation*, Volume XXI (Winter, 1988-89), No. 4, p. 56. The author notes: "However, as the assignment work is carried out under the guidance of the state plan, it is necessary for the graduates to submit to the needs of the country's construction plan. Thus a conflict of interest between the state plan and personal preferences will inevitably come up. It is imperative to educate graduates in the importance of integrating the pursuit of their ideals, well-being, and career with the needs of the state, and call on them to translate their patriotism into action to serve the country and happily accept the state assignment." *Ibid.*, p. 59.

33. Johnson, "The Economics of Higher Education Reform in China," p. 3.

African students are mostly on scholarships and are financially insulated from the conditions plaguing the Chinese students: shortage of housing, and rising costs (*e.g.*, African scholarship students are given a stipend adjusted for inflation and a two-person dormitory room while Chinese students may average six to a room and may have to pay tuition.) The students from Western nations, increasing since China's opening to the West, are self-financing and affluent and eagerly welcomed by the cash-strapped Chinese universities. The contrast between these affluent Western students and the near-poverty of Chinese students is quite evident. Incidents broke out between Chinese students and African students at the end of 1988 (during my visit to China) and carried over to 1989 which had racial overtones. Besides this resentment of foreign students, the Chinese students have been dissatisfied with increasing costs, poor teaching standards, and restrictions on contacts with foreign students and other foreigners. Chinese students feel underprivileged in their own country.³⁴

The prodemocracy demonstrations by students in Tiananmen Square and their criticism of corruption in government shows an opposition to current conditions. The imposition of martial law in May of 1989 and the brutal army attack on the students June 3-4, 1989 may further intensify student resentment. The growing movement to crack down on the universities may also bring a chilling effect to education reform efforts in higher education.³⁵

Education finance

China's prosperity under the "Four Modernizations" has brought to the forefront whether education is receiving its share of funds.

Lu Chia-hsi, the ex-president of the Chinese Academy of

34. Tai Ming Cheung, "China: Frayed Welcome mat," *Far Eastern Economic Review*, February 18, 1989, p. 32.

35. For the role of students and the significance of this struggle for China see May and June issues of the *Far Eastern Economic Review* and Kerry B. Dumbaugh, "China in Crisis: Public Dissent and the Power Struggle," CRS Issue Brief, June 6, 1989 (update), Washington, D. C.: Congressional Research Service, Library of Congress.

Sciences, told journalists in 1988 that China had talked about education, science, and technology but had accomplished little. Ch'ien Chia-chu, a well-known economist and a delegate to the Chinese People's Political Consultative Conference (CPPCC) faulted a lack of money for China's educational problems. While recognizing the increase in dollar amounts for expenditures, he observed that China's 2.5 percent of GNP was much less than the 6 or 7 percent advanced nations spent on education.³⁶ The expenditure question has been raised in Chinese publications. An article entitled "Three Accounting Entries on the Question of Expenditures for Education" appeared in the *China Human Skills Daily* (*Zhongguo Rencai Bao*), refuting the concept that education spending in China experienced an increase. Considering the increased enrollment of students — plus inflation — amounts spent on education have been diminishing each year and the problems of educational institutions at all levels with regard to expenditures have been growing greater.³⁷ During the 1988 National People's Congress, delegates pointed out that according to a 1986 audit more than 400 million yuan of educational funds had been diverted to other purposes.³⁸

The funding issue is also related to problems in the teaching profession. A number of educators with whom I spoke did admit that salaries for teachers were a problem. Overall, shortages of teachers, especially qualified ones, have afflicted the school system. Despite efforts by the State Education Commission to make training of teachers a top priority, it is difficult to attract teachers because of their status: being a teacher means a lot of work, low pay, and poor housing. In the estimated 49,800 teachers in secondary normal schools in China, only about 48 percent are university graduates.³⁹ One

36. Chang Chen-pang, "The Problem of Education in Mainland China," *Issues and Studies* (June, 1988) pp. 8-9.

37. "The Era of Teng Hsiao-p'ing [Deng Xiaoping] Educational Policy A Complete Failure," *The Perspective Monthly*, Hong Kong, December 18, 1988, reprinted in *Inside China Mainland*, Volume 11 (March, 1989), No. 3, No. 123, p. 3.

38. Chang, "The Problem of Education in Mainland China," p. 10.

39. "Lack of teachers hobbles education," *China Daily*, April 29, 1987.

graduate student is quoted on explaining why he was not going to pursue a career in the academic field: "We do not want to follow in the footsteps of those professors whose monthly salary is only enough to buy ten chickens."⁴⁰ And the situation is illustrated by a suggestion, perhaps in jest but perhaps not, made by the director of a research institute in Beijing who proposed that full professors should receive the same salary as waitresses at the nearby Shangri-La Hotel in Beijing.⁴¹

Summary

Despite efforts to expand and improve education during the decade of the "Four Modernizations," the results have not been satisfactory for the People's Republic of China. Much of the effort in the past decade has been devoted to repairing the damage inflicted on the educational system during the Proletarian Cultural Revolution. Current achievements may be behind those in the period 1949-1966.

The 1989 comment of the Minister of Education Li Tieyung reflected the view of Deng Xiaoping:

Our education is backward, our people's attainments fall short, and the low level of education has become a major constraint on our country's modernization and reform.⁴²

The National People's Congress, meeting in March of 1989, took up the question of education but seemed to resolve very little. The delegates did recognize that China faced an educational crisis which might require new policies. Educational spending was increased 10 per cent the budget (about \$8.1 billion in U.S. dollars) but no details were given on a comprehensive new long-term plan for educational development and reform which supposedly had gone through eight

40. Leo A. Orleans, "The Effects of China's 'Business Fever' on Higher Education at Home and On Chinese Students in the U.S.," *China Exchange News*, Vol. 17 (March, 1989), No. 1, p. 12.

41. WuDunn, "China's Intense Love of Education Cools Off," p. 18.

42. *Ibid.*

successive drafts during the previous year.⁴³

Politics and education are closely linked in China, more so than in other nations. The whole debate — who is responsible for the failures of the education policy, what should be done now, and what would the ramifications be of a new policy which would affect crucial questions of centralization and government financing — may involve the succession struggle.⁴⁴

43. *Ibid.*; Robert Delfs, "Avoiding the issues," *Far Eastern Economic Review*, April 6, 1989, p. 13.

44. Delfs, "Avoiding the issues," p. 13.

THE SIGN FOR ZERO

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The history of numerals holds a dual fascination since development of science presupposes numbers and the usage of numbers by the common folk can reveal surprising aspects of cultural life. Many of these dual issues for different civilizations are explored in Karl Menninger's *Number Words and Number Systems* (1958, 1969). But the story of how number systems evolved in early times is not very clear. Perhaps this evolution can be best seen in the Indian civilization, which since the Rigvedic age seems to have been interested in numeric questions. Georges Ifrah in his *From One To Zero: A Universal History of Numbers* (1981, 1985) has given an interesting account of the history of the Indian numerals. These are the common numerals and they are also called the Hindu-Arabic numerals. Ifrah has sketched a plausible explanation for how the place value system of the Indians may have arisen upon the use of the counting boards. The place value system with a clear use of zero goes back at least to +458 where it is used in *Lokavibhāga*, a Jain work on cosmology. The earliest epigraphical evidence relating to the use of the nine numerals in a place value manner goes back to +595 on a copperplate deed from Sankheda (Datta and Singh 1935). But some symbol for zero must have been in use in India as early as -200 since Piṅgala in his *Chandah-sūtra* describes a representation system that is binary, as in modern computers, that would clearly need a symbol for zero. And much before Piṅgala, the grammarian Pāṇini used the notion of the null (zero) operator in his *Aṣṭādhyāyī*.

One question that has not been addressed by Ifrah or earlier historians is the shape of the zero sign. Why is it a circle or an oval rather than some other shape? The evolution of the shapes for the other signs is well understood and so it will not be recounted here, but it has generally been assumed

that the sign for zero appeared suddenly. The objective of this note is to provide an answer to this question and sketch how the final form must have evolved. We wish to sketch also a developmental process that is likely to have lead to the round form of the zero sign. This allows us to be more definite about the epoch when the sign was developed. We will also present arguments as to why the zero sign in India came to be fully developed with both the place value notion as well as the notion of null value associated with it.

That these questions are relevant is seen by noting that the Mayans and the Babylonians who, independently, invented their zeros picked very different forms. Furthermore the Babylonian and the Mayan zeros were not fully developed in their conceptual and operational meaning.

Numbers in Sanskrit have been expressed in different orders. Numerals were expressed in symbolic form in the place value notation in the order starting from the units. This occurs both in *Lokavibhāga* as well as *Āryabhaṭīya*. This order of representation is the order in which numbers are expressed in Classical Sanskrit. Thus 14 is *caturdaśa* (4+10), and 517 is *saptadaśādhikapañcaśatam* (7+10+500). While this is how numbers up to 99 are built up in Indo-Aryan languages, the numbers above 100 were actually represented in the reverse order excepting for the last two places. This is true also for Sanskrit as confirmed by checking numerical references in *Śulvasūtras* (Sen and Bag 1983). Thus in Baudhāyana SS., 225 is expressed as *dve śate pañcaviṃśatiśca* (BSS. 16.8) which is 200+5+20, or 187 is written as 100+80+7 (BSS. 11.2). Likewise *Vedāṅga Jyotiṣa* (Sastry 1985) expresses numbers sometimes in the same style. In other words there existed two styles for expressing numbers that were well established: one, in formal texts where to be consistent with the structure of numerals until 99 all numbers were expressed starting with the units; second, actual writing in terms of numeral signs was in the usual place value form starting with the highest order. This is confirmed by epigraphical evidence (Datta and Singh 1935) as well implied by rules for various mathematical operations in *Āryabhaṭīya*, *Brāhma-Sphuṭa-Siddhānta* and other

mathematical works.

Brahmi was in general use in India during the centuries that the sign for zero is likely to have been developed. Now 10 in Brahmi before the advent of zero was written as a fish sign, α . In later forms it was also written as with a single curving stroke ($\sim$), or with the Asokan 1 attached to a circle (α).

Using these forms one can now write numbers such as 15 as

αh , $\sim h$

where h is the Brahmi 5. In these forms, once the place value notation had become clear, we have the identities

$$\alpha h = -h, 1h ; \sim h = -h$$

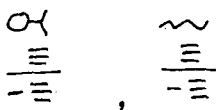
since 1 was written as a vertical stroke in Aśokan Brahmi. Therefore it is not unlikely that the shape of zero was determined by the oval related to the fish sign of the Brahmi 10. In numbers such as the one above, the zero sign clearly had the null (*śūnya*) value which explains its name. We also see how the two concepts expressed by the Indian zero, namely those of the place value and that of nothing, are likely to have become evident.

The significance of the reversed order usage may have played a role in the clarification of the concept of zero as 'null'. A sum such as 10+3 would now be performed as

α  , $\sim$ 

and here as well zero would the value 'nothing'. In the

standard form:

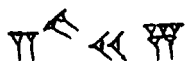


Perhaps the simultaneous existence of the two forms of expressing numbers helped in the development of the dual concepts associated with the zero sign.

We encounter the $\oslash$ form for 10 in the 1st and 2nd century A.D. Nasik inscriptions, and in the 1st and 3rd century Andhra and Kṣatrapa inscriptions. And the curved form $\sim$ is seen in the 4th century Jaggayapeta and Pallava grants (Datta and Singh 1938). Therefore it is conceivable that the development of the zero sign occurred in these epochs.

But the above epochs do not provide a definite era for the discovery of the zero sign, since it is likely that the new usage competed with the traditional number system for centuries. In fact one would expect that inscriptions and deedplates would tend to follow the older and more commonly known style for a long time. For a parallel consider Europe where it took the Indian numerals more than 600 years to oust the less convenient Roman numerals. Even in India the older additive system with special signs for 10, 20, 30, and so on continued to be used, alongside the place value system, for centuries.

The development of the zero sign in India was motivated by numerical calculations. This is to be contrasted from the manner in which the zero signs arose in Babylon and Mexico, where the motivation was from the areas of astronomy and calendrical calculations. The Babylonian astronomical tablets use a sexagesimal numeration system. But it is imperfectly developed being partly additive and partly place valued as within the base of 60 a decimal system is used. The Babylonian system has only three specific symbols, namely those for 1, 10, and the later symbol for 0. Unless the groups of wedge marks are separated it is always possible to miscalculate the indicated number. This is seen in the example below:



This can be interpreted either as $2;0;25 = 7225$ or as $2;0;20;5 = 217205$.

The Mayans, on the other hand, used a vigesimal system but with a serious irregularity since its units were 1, 20, 18×20 , 18×20^2 , 18×20^3 , and so on. Thus in this system the glyph representing a seashell (which is the 0) does not work as an operator, as it should in a true place value system. Furthermore the numbers up to 20 are additive as in the case of the Babylonian system, and therefore there exists the same possibility of ambiguity. The surviving inscriptions and codices do not write the numbers without specifying the units, which eliminates ambiguity but shows that the abstract nature of the place value number system was not fully understood. Clearly this system was also not designed for the needs of ordinary calculations. The rationale behind the Mayan system was the counting of the days of 18 months, each of 20 days.

In view of the demonstration of the derivation of the Brahmi numerals from the earlier Indus numerals (Kak 1989, Kak 1990), especially how the Indus 5, and 10 became the corresponding Brahmi signs, the above derivation pushes the ancestry of the zero sign to the third millennium B.C.

The choice of a circle, or sky, or space *kha* for zero had a happy reinforcement from the Brahmi sign for *kha* which is a circle with a hook on top of it.

To conclude, we see that the development of the concept of zero and its form in India was related to the form of the Brahmi sign for 10. Furthermore we see that the explication of the full power of the symbol may have been aided by the two different ways of expressing numbers in Sanskrit. We have identified a late form of Brahmi 10 as the immediate parent of the zero sign.

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LEXICAL RELICS (ROM. *TEAFAR*, GERM. *ZAUBER*, ENGL. *TIVER*): A REMINDER OF PREHISTORIC RED-DYE RITUALS

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This interdisciplinary study points out the existence of etymologic links between an obscure Romanian word, *teafar*, and some Germanic terms originally referring to white magic (Germ. *Zauber*, Engl. *tiver*). Some of those terms, in their turn, point to archaic ritual red-dye markings, which have been attested, both archaeologically and ethnographically, in various Eurasian areas. The Romanian and Germanic words under discussion have no clear IE source. However, certain Etruscan correlations, and a reference to a well-known IE root, **deiw-*, may be of much help; and all these suggest directions for further research.

Etymological undertakings often tend to lead us out of the territory of attested language, forcing us to move to the rather insecure ground of paleolinguistics. We may touch archaic periods and remote cultures, without being able to definitely establish all the stages of the phonetic-semantic evolution, or the primeval origin of a word. One thing should be kept in mind: languages and peoples die – words survive.

Careful observation of the ethno-cultural background and of archaeologic-historical finds and facts can often provide a basis for significant explanations of linguistic aspects. Such an approach may be exemplified by an etymological analysis of Rom. *tefar/tjafar*/, which, on the one hand, proves to have an unexpected Gmc. relative, but, on the other hand, forces us to envisage a source older than the earliest forms of Germanic.

Confusingly Divergent Explanations

Recent Romanian dictionaries (*e.g.* DEX) give the following senses of Rom. *teafar*: 'healthy, whole, unharmed, sane.' As regards the etymology of the word, the label "of unknown origin" has remained firm. Though there have been several

notable attempts at explaining the word, they all appear as either hesitant or hazardous.

Reichenkron (1964: 244) considers that *teafar* should be explained by an IE **steip-* "Stange, Stecken, steif," from which words like Arm. *step* "haufig, Kraft, Zwang" also derive. According to Reichenkron, it is the influence of (the little known) Rom. *(s)teg* "Stange, Pfahl, Stock" which may have caused the disappearance of initial /s/ in *teafar*. The German linguist's etymology is feeble, and it becomes even more so when, in a later work (1966: 162), he proposes another reconstruction, **ste(i)b(h)* – as a variant of **steip-* –, given in order to account for the /f/ in *teafar*. Reichenkron's attempt is useful insofar as it reveals both the difficulty of finding relatives for Rom. *teafar* in other languages, and the singularity of the word in Romanian.

Cioranescu (1958, s.v. *teafar*) considers that the Romanian word under discussion is of "origen desconocido," though he suggests (quite improbable) links with Greek and Turkish. Cioranescu also reviews earlier etymologies (proposed by authors like Tiktin, Giuglea, Scriban) and, rightly, regards them as "no mas convincentes."

It is worthy of remark that *teafar* is now generally known and used in Daco-Romanian (i.e. North-Danubian Romanian, including literary language), but not (or no longer?) in Aromanian (Macedo-Romanian), as we may conclude from the fact that no such word appears in Papahagi's dictionary (1974).

The Germanic Evidence

By proposing a link between Rom. *teafar* and a group of Germanic words, I do not mean to include *teafar* among the recent borrowings from Transylvanian Saxon, High German, or Yiddish (e.g. Rom. *fraier*, *laibar*, *mahar*). Rom. *teafar* finds no relatives at that level. The first possible correlation I observe supposes a historically sustained relationship between East Germanic (Gotho-Gepidic) and pre-documentary Romanian. But, I should show my stages of research first.

On Germanic ground, there is a seemingly strange relation between dial. Engl. *tiver* 'a red coloring matter' and Germ.

Zauber 'witchcraft.' Engl. *tiver* also designates, according to OED, the action of painting boards, or marking sheep with the dye called *tiver*. The word under discussion is quite old in English (first attested in AD 975), the two earliest versions, OE *teafor/teapor*, referring to "minium, red lead." *Tiver* must have been quite firmly rooted in English: though, after a series of attestations in OE, it "got lost" in ME and EModE, it emerged again during the 18th and 19th centuries. As Gmc. relatives of *tiver*, OED indicates OHG *soubur* > Germ. *Zauber* and ON *tauftr* "secret or magic writing, charm, talisman." Further information on *tiver* is to be found in Makovskij (1980: 117), who mentions both OE *teafor* (noun), and an OE verb, *tiefran*, as sources for today's *tiver* (noun and verb).

Kluge (1967, s.v. *Zauber*) analyses Gmc. words belonging to the well-attested family that includes *Zauber* and its direct relative, Dutch *toverij* 'witchcraft.' It is Kluge's dictionary which demonstrates the validity of the link between OE *teafor* "Roteisenstein, Rotel" and OHG *zoubur*, especially by mentioning the fact that runic inscriptions were painted red ("mit roter Farbe waren Runen eingerieben"); so, in times of yore, *Zauber* must have meant 'magic secret writing' ("zauberkraftige Geheimschrift").

The relations between *Zauber* and the archaic sense of red-paint may, first of all, account for the (now obscure) connection between Gmc. words referring to "witchcraft" and a word like Engl. *tiver*, which, semantically, seems to have remained (as early as OE) devoid of the original magic-ritual implications. The very order of the meanings OED mentions after ON *tauftr* (see above) reveals the possibility of a (pre-Christian) semantic extension: 'bewitched' > 'blessed' > 'wholesome,' i.e. the way towards the sphere of Rom. *teafar*. Before a further step in this linguistic analysis, we should survey some facts provided by other domains.

Prehistoric Red-Dye in Archaeology

Archaeologic-historical literature abundantly attests to the importance of red coloring matters, and especially of red ochre, in rituals performed through millennia, from the Stone

Age to recent times. For the direct purposes of this study, I shall refer only to the Near and Middle East, and to Europe.

Red ochre was ritually used in Europe during the Paleolithic, "when the narrow passages, oval-shaped areas and small cavities in caves were marked or painted entirely in red, "possibly to symbolize "the color of the Earth Mother's regenerative organs" (Gimbutas 1985: 8). The funeral usage of red ochre certainly goes back as far as the Mesolithic in central Europe: "the woman of Unseburg" has already become famous. She was found in her grave (in a left-side Hocker position), attended by flint implements, and with a halo of red dye ("Rotel") round her skull (Weber 1988, Bach/Bruchhaus 1988).

In the oldest ("proto-Neolithic") burials of Romania, at Schela Cladovei, the skeletons (supine or crouched) are surrounded by "red ochre lumps" (Miclea/Florescu 1980: 55). As for the Advanced Neolithic of SE Europe, "stone containers for crushing ochre" (Gimbutas 1980: 47) are among the common finds. They were as common, it seems, at Tepe Sialk in Iran (about 5000 BC), where stone mortars for crushing "make-up" (Huot 1965: 84) were discovered in a context of Hocker-ochred inhumations and rib-and-flint "sickles" of the same kind as the ones which mark the dawn of agriculture in the SE European (Cris-Starcevo) Neolithic (Miclea/Florescu 1980, photo 19). The formula "sprinkled with red ochre" occurs as a leit-motif in works on SE European funeral rites, from the early Neolithic to the Bronze Age: as a typical example, in Boean inhumation, the paint traces on the skull suggest that, "before being buried, the whole face of the deceased had been painted with ochre" (Comsa 1987: 151). This reminds one not only of the Unseburg foremother, but also of the fact remarked by Eliade (1981, I: 46): the Neolithic Near East finds include the skulls of Tell Ramad (Syria), which bear obvious traces of red paint.

The penetration, in successive waves, of the North Pontic mounted ("Kurgan") people into eastern-central European territories (probably beginning as early as the mid-5th millennium BC) produced not only major ethnic and socioculture changes, but also a "reinforcement" of ochre inhumation

(Kalicz 1968: 21, 30, 32, 35; Gimbutas 1979: 15, 117, 127). A recent discovery in the area of the "Tripolye culture, Usatovo variant" is that of "a large group of burials with traces of ochre on the faces and heads of the buried" (Zinkovskij/Petrenko 1987: 39). The authors compare those finds with similar ones from the Neolithic site of Catal Huyuk. The durability of ochre inhumation in SE Europe is proved, for instance, by the fact that the Bronze-Age (post-2000 BC) menhir-grave of Hamangia (SE Romania) observes the same ochre-sprinkling rite (Comsa 1986: 285).

To conclude, red ochre (lumps or dust) is specific of a kind of funeral practice of impressive persistence, spreading along a Eurasian axis that we may label as Sialk-Unseburg (though the two geographical extremes do not represent the same period). I leave it to archaeologists to establish the sources, variants and chronology of that phenomenon. For this work, it is sufficient to mention a very sensible supposition: according to Marija Gimbutas (1979: 127) the ritual purpose of the red dye which gave the name to the "Ochre-Grave Culture" was to ensure "blood and life power". I may add that magic red paint or dust were not meant only for after-life wholesomeness.

Ethnography and Semantics

An outstanding Romanian ethnographer, P. Caraman (1988: 177-248) surveys the "talismanic role" (p. 246) of traditional tattooing with Romanians. He demonstrates that ritual body-paint and tattooing "represent in fact the same act" (p. 179), the latter being only a refinement of the former ("a people that practiced primitive body-painting was to practice tattooing too" – p. 180). Caraman sees the roots of such rituals in prehistory; he mentions the Neolithic stone mortars used for crushing dyes to powder, as well as the "dyes preserved in containers of clay, bone or horn" (p. 179). As regards historical records, the same author takes into account Greek and Latin references to body-paint and tattooing with Celts, Germanics, Dacians, Scythians, and other "Picts" (p. 180). What Caraman manages to prove is the continuity of the ritual aspects under discussion, in SE Europe, from prehistory to our times.

A commonly known application of the ceremonial body-paint in today's world is represented by the Indian forehead marks, *bindi* and *tika* (see photos in Rau 1986). A Romanian-Indian correlation is worth mentioning here: an etymologically obscure Romanian word, *benghi/benchi* (possibly from an earlier */*bend*'/), designates 'a sign marked on somebody's forehead for protection against the evil-eye'; there can be no doubt that the significance is the same as in India. In the classic, Ion Creanga's *Recollections from Childhood*, there is a minute and colorful description of how, when, and to whom a Romanian *benchi* was done: "No sooner had Mother got some suspicion about my looks, than she presently prepared, on a slobbered finger, a little mud from the dust on her shoes; or she would rather take some soot from the fireside, saying: 'Just as that heel, or the fireside are protected against the evil-eye, so be my child!' and she would mark a showy *benchi* on my forehead" (my translation). An identical mark (very probably drawn with soot from the archaic altar in the world, the fireplace) may be seen between the eye-brows of a Tibetan child in a *National Geographic* photo (Abercrombie 1978: 348). It is in the same part of Asia, in Nepal, where people also use sacral red-dust; L.M. Bishop (1971: 681) participated in the "blessing" of a newly bought horse: "Karma solemnly sprinkled vermilion powder and rice over the shaggy animal, and Kaluy, another porter, plastered red *tika* marks on our foreheads."

The above-mentioned facts reflect advanced forms of ritual practice; we may, however, suppose that, for primeval healthful smears and sprinkles, real blood was used at first, not a symbolic one. As an example in favor of that supposition: R.P. Jordan (1978) witnessed, in Soviet Armenia, a ceremony which included a cross painted in sheep's blood on an ailing woman's forehead (not long ago, little crosses used to be tattooed on the foreheads of Aromanian girls – Caraman 1988: 197). Sacral blood sprinkling must have been quite deeply rooted with Germanics too, since the Christian religion was forced to preserve a term like OE *bletsian* 'to hallow with blood' (> Engl. to bless). It is not hard to conclude that the heathen custom which has survived in (Christian) Armenia and Engl.

bless point to the origins of all anointments and (holy-water) sprinklings of later (more sophisticated and abstract) forms of religion. Within the same ethnographic-semantic vein, one may take into account the evolution of OHG *wih* (preserved in the German name of Christmas, *Weihnacht*), related not only to Goth. *weihs* 'holy,' but also to Lat. *victima* 'animal used for sacrifice' (Krahe 1966: 16). Such examples prove that, long after Christianization, old heathen terms have survived, with duly modified meanings. A certain semantic decay can, of course, have occurred under Christian pressure. There is, for instance a historico-geographically motivated asynchronism between the horse of Nepal "blessed" with vermilion and the English sheep tivered (for practical reasons) "between the shoulders and across the loins" (OED, s.v. *tiver*), the latter usage showing a degradation of older sacral implications.

As we can see, a discussion on meaning must take into account changes in the semantic spheres not merely of individual words, but also of things, in keeping with the sound Worter und Sachen method. In a study of this kind, we are bound to observe a shift like "blood" > "ritual blood" > "ritual red-dye" > "(mere) red-dye," i.e. a kind of cyclic evolution in significances of things, from the sphere of the physical-only (or, rather, of a physical-sacral simultaneousness) to that of the symbolic-sacral simultaneousness) to that of the symbolic-sacral, then to the more recent degradation to "mere thing." At the same time, it becomes obvious that the significance of each of the particular words proposed for discussion represents one phase or another in a similar cyclic evolution form concrete reference to ritual figurativeness, then, possibly, to "secularism." While Germ. *Zauber* still reflects the middle phase (with an explicable shift from religion to superstition), Engl. *tiver* stands for a final semantic decay. Their proposed relative, Rom. *teafar*, has remained in the realm of white magic, i.e. in the semantic field of "whole sound" (as to the choice of the latter label, I may mention that Engl. whole, holy, hallow, heal, health all come from one and the same root, IE **kailo-* 'whole, uninjured, of good omen' - IER: 1520). What I want to demonstrate here is that the relation between the Gmc. *tiver-*

Zauber family and Rom. *teafar* is wholly justified from an ethnographic-semantic standpoint.

The Probability of an East Germanic Source

In assuming that Rom. *teafar* may be of Gmc. extraction, one must consider the following historical-linguistic facts:

(1) The earliest presence of a (supposedly) Gmc. population in (eastern) Dacia was that of the Bastarnae (during the 3rd-2nd centuries). However, we cannot be absolutely sure about the Gmc. character of the Bastarnae; and they seem to have been too few, and too soon assimilated to leave durable traces (Miclea/Florescu 1980: 130).

(2) There is not doubt about the persistent presence of EGmc. populations in Dacian territories, at a time when the Romanian language was in the making. The Goths dominated the SE European political stage between the 3rd century and the 5th (Wulfila translated parts of the Bible from Greek into Gothic towards the end of the 4th century). The Gepids, in their turn, still had their own kingdom in Transylvania during the 6th century, and, ethnically, they may have lingered there long after the end of that state formation (Diculescu 1925: 15). Also, "in the 9th century, according to Walafrid Strabo, some West Goths remained in the Balkans, when Gothic was still used in religious services at Tomi (now Constantza in south-eastern Romania)" (Bennett 1980: 19). The last relics of Black-Sea Gothic were recorded in Crimea as late as the 16th century (Drahe 1966: 35). Even if the Gotho-Gepids were not very numerous (in comparison with the natives), and, politically, their rule was not as well-established as, say, that of the Vizigoths in Spain, they were bound to leave traces in the local idioms of Dacia. Some of those traces have been pointed out, not always convincingly, especially after World War I, by scholars like Diculescu, Puscariu, or Gamillscheg (see Puscariu 1976: 269, Rosetti 1986: 220, Giuglea 1988: 120). However, after (or rather, in the wake of) World War II, the presence and importance of EGmc. elements in Romanian have been neglected, or even minimized (Rosetti 1986: 223).

(3) The Gotho-Gepids (or at least most of them) became

Arianic Christians after having settled on the Lower Danube; nevertheless, paganism must have remained strong with the Goths of Dacia, as we may conclude from the fact that Bishop Wulfila himself was forced to move to Roman territory, to escape persecution ("perhaps under the heathen leader Athanaric" – Bennett 1980: 23). We should then agree with Diclescu (1925: 3-5) as regards the possibility of a certain stock of vocabulary referring to heathen superstition, borrowed by the (mostly Christianized) inhabitants of Dacia from East Germanics. That stock, however small, may have included an early form of *teafar*.

(4) Rom. *teafar* is, in this form, closer not to the High German features of *Zauber*, but rather to the Common Gmc. reconstruction **taubra-/taufra-* (Kluge, s.v. *Zauber*), and to the more conservative OE *teafor* and ON *taufr*. The Romanian word has preserved both the initial /t/ and an intervocalic fricative, /f/, where High German developed /c/ and /b/, respectively. An analysis of the (regular or irregular) phonetic evolution of *teafar* may appear as rather superfluous if we do not know the exact form of the source-word.

(5) Though the attestation of a Scandinavian (ON) *taufr* would allow us to assume the existence of a similar word in EGmc., we ought to look for such a word in Gothic proper. Gothic texts being basically Christian (Biblical), the chances of finding in them a heathen relative of *tiver-Zauber* would seem to be improbable. And yet, there is a Gothic word, which, though its transcription is uncertain, may be used as a major argument in this discussion. It appears, as *aibr*, in *Codex Argenteus* (see Braune/Helm 1939: 139): "jabai nu bairais aibr bein du hunslastada" (= "si ergo offers munus tuum ad altare" in the *Vulgate*, Matth. V, 23). Germanists, beginning with J. Grimm (see Braune/Helm, *loc. cit.*) agree that *aibr* is actually a mistaken transcription of Goth. **tibr*, a word directly related to the *tiver-Zauber* family: "Es ist dafür sicher tibr zu lesen (ags. tifer, ahd. zepar Opfer)" (Braune/Helm 1939: 175). Goth. *tibr* translates a Greek (Christian) term, (*munus* in the *Vulgate*); therefore, we may include the Goth. word among the old Gmc. terms (like OE *bletsian* and OHG *wih*) which had to be accepted

by the Christian church. Another such term appears in the same above-quoted sentence: Goth. *hunslastabs* is a compound which tries to express the Christian notion of "altar" (*hunsl* 'sacrifice, offering' + *stabs* 'place').

(6) Last but not least, Rom. *teafar* can be explained as a regular phonetic development from Goth. *tebr*, implying a process similar to: Lat. *lucifer* > Rom. **lucef* > *luceafar* 'morning star.' This reconstructive assumption observes several phonetic facts:

(a) Goth. <i> must have been heard rather as a short /e/, if we take into account correlations like: Goth. *itan* 'to eat' = OE *etan* = OHG *ezzan*, or Goth. *silba* = OE *self* = *selb*. Even if the stressed vowel of *tibr* had been heard as /i/, an evolution /i/ > /e/ > /ja/ can be imagined, since there also are Latin words inherited by Romanian which show the same development: e.g. Lat. *crista* > Rom. **cresta* > *creasta*. The Romanian (regular) change /e/ > /ja/ is very similar to the Gmc. "pre-literary" shift known as "breaking" or "a-Umlaut" (Krahe 1966, I: 57). In *teafar*, that shift was produced by the neutral central vowel, which must have appeared as a Romanian (epenthetic) solution to the uncomfortable (syllabic) cluster written as
 in Gothic.

(b) In the consonantal sector, the intervocalic /f/ raises no problem on Old Gmc. ground, since we know that Goth. in a word like *tibr* was a bilabial fricative of the same kind as the one written <f> in Goth. *afar* 'after' (Bennett 1980: 3-4). The of *tibr* must have sounded rather as a weak voiceless /f/ to a Daco-Roman ear. Analyses of the quality of Goth. consonants should not overlook, for instance, the fact that the in Goth. *diabaulus* (< Gk. *diabolos*) survived as <f>, pronounced /f/, in Germ. *Teufel*. The latter should, according to High German rules, have an intervocalic /b/ (see Goth. *ufar* = Engl. *over* = Germ. *uber*, or Goth. *ubils* = Engl. *evil* = Germ. *ubel*); but German inherited *Teufel*, with its central fricative consonant, from the terminology of the Gothic "Arianic mission" (Duden, s.v. *Teufel*). In Gmc. languages which borrowed the Christian name of the "Antagonist" from other sources than Gothic, we find an intervocalic voiced fricative

(e.g. Engl. *devil* < OE *deofol* < Lat. *diabolus*).

After all these arguments I think we may admit that a Gotho-Gepidic origin of Rom. *teafar* appears as quite sustainable not only semantically, but also from the view-point of historical phonology. At this stage of research the EGmc. solution stands closer at hand, mainly because neither Latin, nor the attested neighbors of Romanian can help us explain the word under discussion. On a more general IE ground, however, the matter is far from being settled, first of all because one cannot overlook the fact that, as far as I know, no IE origin has been found for the Gmc. *tiver-Zauber* family.

Kluge (s.v. *Zauber*), after pointing out the link between *Zauber* and *tiver*, mentions that: "Kie Herkunft des Farbnamens bleibt schwierig." And yet, by starting from some of the archaeologic-ethnographic facts above, and especially from the widely spread ochre-dust rituals, I can envisage, at least, the possibility of a Gmc. relation between *tiver-Zauber* and another obscure group, namely that of Germ. *Staub* (OHG *stoup*). the latter shows a phonetic evolution comparable to that of *Zauber*, with the only difference that Germ. *Staub* has (like its direct relatives, Goth. *stubjus*, Dutch *stof*) an ancient s-mobile, which made possible the preservation of /t/ in High German. The family of *Staub* are worth discussing in connection with the *Zauber-teafar* link, especially if we also take into account the existence of German verbs like *stauben* (< OHG *stouben*) 'to blow dust, to powder, to whirl (in the wind)' and *stieben* (< OHG *stioban*) 'to fly about or away in minute particles.' I think we can refer the *Zauber-Staub-stieben* group to Rom. *stafie* 'ghost, phantom,' and to the latter's Aromanian correlatives, *dife* and *stifa*, which belong to the field of "invisibility" and are employed in phrases like "fa-te stifa" = "get lost, go to hell" (Papahagi, s.v. *stifa*). A more extensive study on those words may probably help us integrate the *tiver-Zauber-teafar* connection in a more comprehensive paleolinguistic vision. For the time being, I may only raise some problems regarding the possible common prehistory of that kind of relationship.

Doubts and Possibilities

Smearing "triumphants" with red minium was among the customs of ancient Rome, where Jupiter Capitolinus' face, as well as certain figures on sarcophagi were also painted red. Since such customs had been borrowed by the Romans from the Etruscans (Hirt 1907; 722), we may wonder which of the ethno-formats that contributed to the Italic genesis of the Etruscan people and culture perpetuated such practices into Roman history.

Though in Hencken's work (1968) on the making of the Etruscans I could find no reference to red-dye rituals, the book provides some significant background for the present study, mainly by indicating important links between the (proto-Etruscan) Villanovan culture and the urnfields of eastern and central Europe. Since Villanova was of a rather mixed character, and its population practiced both inhumation and cremation (Hencken 1968, II: 593), it would be difficult for me to decide whether the eastern (Danubian-Balkan-Adriatic) formant, or the central European one was more important for the Villanovan-Etruscan evolution, and for this discussion. I include Etruscan matter here because there was a manifest contribution of the Bronze-Age central Europe (where proto-Germanics were also molded) to the Italic ethnogenesis, and also because there are Etrusco-Germanic linguistic similarities which should be given a thought in this context.

First of all, there are the name of the Tiber (Lat. *Tiberis* > It. *Tevere*) and the imperial name Tiberius, both considered to be of Etruscan origin (Ionescu 1975: 271). Though Rome's river was, in archaic times, known under two other (Etruscan) names, Rumon and Albula, it seems that, at a certain moment, the river was re-named Thepri in Etruscan (> Umbrian *Tifernus*, Lat. *Tiberis*). There is no indication regarding the meaning of that name. What I may suppose is that it was given after (or due to) the great work of salubrity done under an Etruscan king of Rome, Tarquinius Priscus. By remarkable public effort, the *cloaca maxima* was created, "a huge sewer through which the water from the marshy surroundings was drained into the Tiber" (Burian/Mouchova 1973: 62). It was by

that operation that incipient Rome was rid of miasma.

The name of an archaic divinity, Tiberinus, is directly related to that of Ovid's "Etruscan stream" (Ionescu 1975: 271). As for Tiberius, it must be referred to the Etruscan person-name Theprie/Thefarie/Thefri. In a famous bilingual (Etrusco-Punic) inscription from Pyrgi, there appears the name of an important personage, Thefarie Veliiunas, transcribed as TBRY' WLNS in Punic, and translated as Tiberius Velianus in Latin (Georgiev 1966: 401, 19709: 40). Taking into account the probable "salubrious" meaning of the river-name Thepri/Tiberis, and the very common well-wishing purpose of ancient name-givings, I think that Etr. Theprie/Thefarie/Thefri had the same meaning as the names belonging to the very rich IE group coming from a root *wal- 'to be strong,' including Lat. *Valens*, *Valerius*, Gmc. *Walter*, Slav./Rom. *Vlad*.

It should be emphasized that the proposed correlation between Gmc. *tiver-Zauber* and the above-mentioned Etruscan names is not exceptional. In the same field of sacral vocabulary there is a (neglected) relation: Etr. *ais* 'deity,' pl. *aisar* 'gods' (see E. Brit., 8, s.v. "Etruscan language") closely resemble ON 'áss 'god,' pl. *aesir* 'gods' (see AHD, s.v. *Aesir*). And, speaking of Etr. *aisir*, I must add that Lat. *Caesar* has been interpreted as prefixed derivative from that Etruscan word, the name of the famous Roman thus appearing itself as well-wishing reference to "divinity," just like the Gmc. names Oswald or Oswin (to be referred to OE *ōs* = ON *áss* 'god').

By proposing a comparison with Etruscan I do not mean to suggest a non-IE origin for *tiver-Zauber-teafar*, because, first, the IE or non-IE character of Etruscan has not yet been demonstrated (with all efforts of scholars like Georgiev and Pallottino), and, second, even if Etruscan appears to be non-IE in structure, it certainly can contain many IE borrowings (be they from Anatolian, or central European, or Italic IE idioms). To come back to the above-suggested Etr.-Gmc. concord, the latter does not imply only vocabulary, but also phonetics, since both languages show similar kinds of consonant mutation, or Lautverschiebung (the main tendencies being stop > fricative and voiced > voiceless), as manifest in Kluge's double recon-

struction, **taufra-/taubra-* (s.v. *Zauber*), in the OE doublet *teofor/teopor*, and in Etr. *Theprie/Thefarie/Thefri*. All these words can remind of a well-known, and quite productive IE **deiw-* 'to shine, sky, heaven, god' (see IER: 1511, or Walde, s.v. *deus, dies, divus*). From that root, Romanian has, through Latin, *zeu* 'god' (< Lat. *deus*), and Germanic has the name of the sky-and-war god, **Tīwaz* (> PE *Tīw*, ON *Týr*, OHG *Ziu*) and an Olcel. generic plural, *tívar* 'gods' (AHD, s.v. Tuesday; Duden, s.v. Zier; Heusler 1932: 236). Besides, in one of the oldest central European inscriptions, HARIGASTI TEIVA (written in an "Etruscoid" alphabet on the La Tene helmet from Negau – Austria), *teiva* appears to be an early Germanic patronymic derived from *Tīwaz* (Hubert 1983: 203). I must remark that the latter is identical with Luvian *Tiwaz*, the name of a sun-god worshipped by the Anatolian Indo-Europeans (Hubschmid Etruscan diminutives, *Tiuza* and *Tius* (< "Tiu = Gk. Zeus" – Georgiev 1970: 11); it would remain for us to establish whether *Tiuza* and *Theprie* can be seen as relatives on Etruscan ground, or they just met there, coming from different sources.

As I have already suggested, this final part is forced to remain in the realm of supposition. The Etrusco-Germanic correlations (which may also have something to do with the much-discussed Anatolian-Etruscan link) cannot be satisfactorily exploited as long as the position of proto-Etruscans in the central European and Italic ethnogenesis remains obscure (at least as obscure as the primeval origins and the role of the urnfields in the same area). There still is need of consistent contributions to the "Etruscoid" matter, as posed earlier by scholars like Kretschmer and Dečev (see Vraciu 1980: 23).

I may add some inciting questions regarding IE **deiw-* invoked above (and the closely related **dei-/dje-* > Lat. *dies* 'day'). To begin with: how much can that root really belong to the PIE common core, if there is a Sumerian family of words which refer to "divinity" and derive from a basic *di* 'shine' ("glanzen" – Delitzsch 1914: 139), and there also is an ancient Chinese "lord of the sky" called *Di* (Eliade 1986, II: 11)? Mere coincidences? Or signs of a Eurasian common heritage? We

must certainly not forget that the *deiw*-celestial gods are present in all main branches of the IE family (e.g. Skr. *devaḥ*, Lat. *deus*, Lith. *diēvas* – Simenschy/Ivanescu 1981: 482); but that category includes especially "personal gods" (Cassirer 1973: 32), like Zeus, who stand for an advanced form of religion, hardly specific of a PIE society. More primitive (*i.e.* possibly closer to PIE times) are the gigantic (and rather slow-witted) *genii* called *dev* in the Irano-Caucasian traditions.

Yet another constructive doubt: the inclusion of IE **deiw-* in this discussion underlines the Germanic-like phonetic features of Rom. *teafar*, especially the voicelessness of its first two consonants and the seemingly non-Dacian character of its /f/ (since no such sound and no /w/ > /f/ evolution appear in the so far proposed reconstructions of Dacian phonology – Georgiev 1966: 144, Russu 1981: 124); however, there are traces of a Thracian consonant mutation of a kind similar to the ones in Germanic and Armenian (Reichenkron 1966: 201). A "Etruscoid" influence has already been considered as the cause of that phenomenon in Thracian (Decev, quoted by Vraciu 1981: 65). Moreover, Romanian has words of very probable paleo-Balkan extraction which have preserved intervocalic /f/: e.g. Rom. *ceafa* 'nape, backhead' (Alb. *qafe*), or the above-mentioned Rom. *stafie*, Arom. *dife/stifa*. The /f/'s of those words, and that of *teafar* (especially if the latter is related to IE **deiw-*) probably reflect a *Lautverschiebung* in the Neogrammarian sense (as does, for instance, the voiceless initial sound of Tuna, the Aromanian name of the Danube). In fact, many of the "alternations" (/p/f/, /k/h/, or /t/d/) to be found in different versions of Romanian (and especially Aromanian) words of obscure origin may be compared to the similar ones observed by E. Furnée (1972) in pre-Greek, and also to those occurring in words attributed to pre-Roman substrata (see, for instance, the Oriental-Mediterranean isogloss *taba/tepa/tifa/tiffa* 'peak, cliff, hill' – Hubschmid 1960: 49). Certain such European substratum words have been supposed to derive, at least in Spanish, from the idioms spoken by "invasores arcaicos procedentes de Centro de Europa" (Corominas, s.v. *nava*), or, more precisely, from a "lengua indoeuropea prerromana,

verosimilmente lo de los antiguos invasores indoeuropeos de Espana, enterrados en campos de urnas" (Corominas, s.v. *suero* – a word which is perfectly comparable to the "sourceless" Rom. *zer* 'why!'). As for an archeological basis for such paleolinguistic aspects, it seems that more and more precise facts regarding the Spanish "campos de urnas" and their links with central European and eastern Mediterranean Bronze-Age sites have become known during the last decades (see Molas/Rafel/Puig 1983).

New conclusions produced by further research may lead to a better view on what appears now as a lacunary set of relations connecting prehistoric red-dye rituals, urnfield elements, Etrusco-Germanic and Germanic-Romanian close resemblances.

General Conclusions

(1) A study of the Gmc. *tiver-Zauber* family in connection with a series of archaeologic-historical and ethnographic data regarding red-dye rituals leads to a more comprehensive vision not only of the history of germanic languages, but also of the Germanic pre-Christian spiritual life.

(2) It is only by an interdisciplinary approach that the (direct or indirect) relation between *tiver-Zauber* and Rom. *teafar* may be made to appear as sustained.

(3) Though the Germanic connections seems, in itself, sufficient for a coherent etymology of Rom. *teafar*, there also exists evidence indicating rather a pre-Germanic and pre-Roman substratum relationship. That evidence should not be neglected, since it might become richer and clearer in the future, especially if better explanations are achieved for urnfield and "Etruscoid" aspects.

(4) Though Rom. *teafar*, as well as its probable Germanic and Etruscan relatives, may be referred to IE **deiw-*, the Romanian word does certainly not derive from Latin (since IE **deiw-* > Lat. *deus* > Rom. *zeu*).

(5) The problems raised by the lexical survivors belonging to the *tiver-Zauber-teafar* axis are not merely linguistic, since, as the present study tries to demonstrate, by tracing the history

of those words we open a way to the very roots of Eurasian religion, whose earliest properties surely included sacral red-dyes. It remains for further research to specify whether we should attribute the terms of the above-mentioned axis to the ample North Pontic ("ochre-grave") vector, to eastern-central European urnfields, or simply to some "Picts" at the dawn of European history.

ABBREVIATIONS

- AHD	The American Heritage Dictionary	- IE	Indo-European
- Alb.	Albanian	- IER	"Indo-European Roots" in AHD
- Arom.	Aromanian Macedo-Romanian	- It.	Italian
- dial.	dialectal	- Lat.	Latin
- DEX	Dictionarul explicativ al limbii române	- Lith.	Lithuanian
- Duden	Duden - Herkunftsworterbuch der deutschen Sprache	- ME	Middle English
- E. Brit.	Encyclopaedia Britannica	- OE	Old English
- EGmc.	East Germanic	- OED	The Oxford Dictionary
- EModE	Early Modern English	- OHG	Old High German
- Engl.	(Modern) English	- OIcel.	Old Icelandic
- Etr.	Etruscan	- ON	Old Norse
- Germ.	(Modern High) German	- PIE	Primitive IE
- Gk.	(Ancient) Greek	- pl.	plural
- Gmc.	Germanic	- Rom.	Romanian
- Hind.	Hindi	- Skr.	Sanskrit

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BLOOD GROUP GENES AND ANTHROPOMETRIC MEASURES AS PREDICTORS OF MENTAL ABILITY OF BLACKS AND WHITES: PART I

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At the Autumn meeting of the National Academy of Sciences in Durham, North Carolina, October 1966, ten years after he had been awarded the Nobel prize in physics, William Shockley urged fellow members of the Academy to foster research on the effects of heredity, including race, on human behavior. He expressed belief that such research would inevitably bear on the intelligence distribution of ethnic minorities in general and the American Negro in particular. Citing a 1953 paper by Glass and Li (1953), Dr. Shockley offered what he called a new invention, the H-Index, for applying statistical analysis to the genetics of ethnic minorities. A short time after the NAS meeting in Durham, while we were collecting data for The Georgia Twin Study, Shockley's H-Index came to my attention. As one aid in determining zygosity for the twins, blood samples for 48 pairs of MZ and DZ twins were collected. Also as part of the twin study we administered the same battery of psychological tests used by Dr. Steven Vandenberg in the Louisville Twin Study (Vandenberg, Stafford and Brown, 1968). With the blood gene data and psychological test results it occurred to a colleague and me that we had the raw data to test Shockley's H-Index hypothesis. Results published in 1971 (Osborne and Suddick 1971) gave modest support to the H-Index. The magnitude of the correlations between selected blood groups and mental ability for blacks was in the .30s with two rs in the .40s. For the white group no r that high was found; Duffy and Lewis blood groups yielded the highest rs which were in the .20s. (Osborne and Suddick, 1971).

A year following the publication of the Osborne-Suddick paper Dr. John Loehlin of the University of Texas requested

a copy of our data. He also obtained from Dr. Vandenberg a copy of his Louisville Twin Study data. Since both the Georgia and Kentucky twins were given the same battery of psychological tests and had blood samples analyzed at the same laboratory together the two groups generated a relatively large subject pool. The Kentucky sample was composed of 388 white and 44 black teen-age twins. In the Georgia sample there were 54 whites and 42 blacks. Loehlin's analysis of the Georgia and Kentucky data was published in 1973 in *Behavior Genetics* under the joint authorship of Loehlin, Vandenberg and Osborne (1973). The new and different analysis of the combined samples did not support Shockley's hypothesis. Although Loehlin said "the results do, in our view, lend support to the position of Shockley, Jensen (1969) and others that research on U.S. Negro-white differences using blood group techniques is both practical and instructive" (Loehlin, Vandenberg and Osborne 1973).

The purpose of this study is not to correct the typographical errors and reconcile discrepancies between the two blood gene studies mentioned above but to enhance the forecasting efficiency of the 1971 regression analysis by adding other physical measures to the equation. In addition to height, weight, handedness, color blindness and eye and hair color five physical measurements were taken of each twin. Using standard techniques described by Montagu in *An Introduction to Physical Anthropology*, (Montagu 1951) face length, head length, head breadth, head circumference and nose length measures were taken for all twins. Thus we had for each of the 96 subjects the blood gene data reported in the two previous studies and five new heritable physical measurements. For blacks there were six blood gene predictors from the Osborne-Suddick (1971) report and five new heritable physical measures. For whites the numbers were five blood gene predictors and the five physical measures.

The idea that human anthropometric characteristics are related to mental ability is not new. As early as 1902 (Pearson 1902), perhaps even before, no less authority than Karl Pearson attempted to correlate intelligence and head measure-

ments. There were at least two additional published papers by Pearson (1906, 1925) and one by Pearl (1906) examining the relationship between physical measurements and mental ability. The correlations for these early studies were positive but small. In 1961 Clark, Vandenberg and Proctor (1961) were the first to report significant correlations between head size and mental ability. They concluded that "tests which correlate highly with these physical measurements may be better measures of innate capacity than those which do not." Now that he is vindicated (Joynson 1989) at least two papers by Sir Cyril Burt should be added to the list: (Burt, 1944) and (Burt 1947). As some of his students and supporters have maintained all along it was not Burt's invariant correlation coefficients that infuriated the media and other critics but it was his staunch belief that "1. Evidence from different branches of psychology leads to the notion of a mental capacity that is (i) cognitive, (ii) general, (iii) innate. 2. Each of these three characteristics has been amply verified by statistical research." (Burt, 1955, p. 176.)

The present paper is Part I of a three part series of papers designed to examine Shockley's H-Index and related hypotheses. The same Basic Battery of mental tests was administered to all subjects in the series of three studies. For reasons explained in detail in *Twins: Black & White*, (Osborne 1980) blood samples and anthropological measurements were not taken for all participants. As indicated above, for subjects in Part I both blood samples and physical measurements were taken. For those subjects of Part II all anthropological measures were taken but no blood tests were made. Part III of the series involves participants who had blood samples taken but no physical measurements. The irregular pattern of subjects with blood tests and physical measurements in no way affected the study of twins (Osborne 1980) since these variables were only used as aids in determining zygosity. By breaking the data down into three parts as described above subjects in each part will have had all tests designated for that phase of the study. Therefore, in each part of the study there are no subjects with missing data for the part of the study under investigation.

Included in the original battery of tests for the Georgia and

Kentucky samples were 19 different psychological tests (Osborne 1980) requiring the better part of two days to administer. Some tests were experimental; others were buffers such as Social Perception, not expected to yield much mental ability information. The Mazes tests, designed to be administered individually, were of absolutely no value when administered as a group test to teenagers. In both the 1971 and 1973 studies all 19 psychological tests were represented in a single mental ability factor. Upon further careful analysis of the test results it was decided to use only the twelve tests called the Basic Battery. The justification for use of this comprehensive battery of twelve tests is spelled out carefully in *Twins: Black and White* (Osborne 1980). Since all of the tests were of different lengths and made up of different mental tasks results were standardized for age and converted to twelve separate tests each with a mean of 100 and a standard deviation of 15 much as the Wechsler Scales are standardized. And also as Wechsler did, the twelve tests of the Basic Battery were averaged to yield a single score of mental ability. The score, called TotIQB in the remainder of this paper, represents an average of twelve tests which reflect the standard verbal, numerical and spatial abilities (Osborne 1980).

Results

In the 1971 study Osborne and Suddick found the mental ability criterion could not be predicted with the same degree of confidence for the two racial groups. The explanation was not that the variability of the Mental Ability Index score for blacks is greater than that of whites; in fact, the opposite is true as the standard deviation of the z-scores of black's Mental Ability Index is .50 and of white's is .63.

When Mental Ability Index (MAI) was predicted by race and blood gene variables for the combined black and white groups it was found that race accounted for the major portion of the variance. Rather than use the total group, blacks and whites, it was decided that separate equations for each group were more appropriate for predicting MAI, (TotIQB).

TABLE I
CORRELATIONS BETWEEN MENTAL ABILITY SCORES AND
SELECTED BLOOD GROUPS

White Sample = 54; Black Sample = 42

Score	Blood Groups							
	s	Lea	K	Fya	Jka	A1	A2	B
TOTIQB (Whites)	-	.186	.153	-.244	-.224	.063	.223	-
TOTIQB (Blacks)	.215	-.457	-	-.344	.200	-.223	-	-.222

In Table 1 rs between selected blood gene groups and mental ability are given by race. The table is repeated here for the reader who does not have the Osborne, Suddick paper handy. The correlations vary slightly from those reported in the Loehlin, Vandenberg and Osborne paper. The discrepancies could be due to the fact that for some reason all subjects were not included in the latter study.

TABLE 2
CORRELATIONS BETWEEN MENTAL ABILITY, AGE, AND
PHYSICAL MEASUREMENTS

White sample = 54; Black Sample = 42

Correlations

TotIQB vs Five Physical Measures (Raw Scores)

	Face length	Head length	Head breadth	Head circ.	Nose length
Whites	.344	.294	.315	.325	.477
Blacks	-.052	-.036	.457	.252	.102

Age vs Five Physical Measures (Raw Scores)

Whites	.195	-.131	.066	-.083	.433
Blacks	.228	-.122	.055	-.105	.292

TotIQB vs Five Physical Measures (Age Standardized)

Whites	.385	.375	.301	.435	.411
Blacks	-.151	-.133	.446	.148	.230

Age vs Five Physical Measures (Age Standardized)

Whites	-.084	-.056	-.049	-.019	-.007
Blacks	-.008	-.038	-.070	-.023	.156

The five new physical measurements (in millimeters) of face length, head length, head breadth, head circumference and nose length were correlated with TotIQB by race. Since the age range of our subjects was from 13 to 18 it was suspected that raw scores of the physical measurements would be significantly related to chronological age. That is, face length, head length and the other physical measurements would be larger for older than for younger subjects. In Table 2 age is correlated with the five physical measurements. The interesting thing here is not the magnitude of the r s but their pattern for the two races. With age the r with face length is .195 for whites and .228 for blacks. For head length the difference in r s is .009 but both races show a negative r with age, -.131 (w), -.122 (b). For head breadth both correlations with age are positive, .006 (w), .055 (b). Head circumference for both races is inversely related to age with r s -.083 (w) and -.105 (b).

Of the five physical measures studied, nose length shows the highest positive correlation with age, .433 (w), .292 (b). From Table 2 it is clear that the physical measures are related to chronological age. While the r s differ from one measure to the other the pattern is the same for both races.

With age a significant influence on two of the five physical measures it was decided to adjust the physicals for age and again correlate the results with CA. Now when physical measurements are correlated with age the differences are

insignificant and the pattern of the differences between the two groups disappears, Table 2.

The next question to be asked is: are the selected physical measurements related to mental ability? The answer is yes but there is no pattern of correlations. The r s between TotIQB and physical measures range from .294 to .477 for whites and -.052 to .457 for blacks. Among the five physicals the most significant correlation with mental ability for whites is nose length(.477); for blacks, head breadth (.457).

To reduce or eliminate the age factor in the relationship between physical measurements and mental ability the physicals were age adjusted and converted to standard scores with a mean of 200 and a standard deviation of 30. With age influence controlled the r s between mental ability and physical measures range from .301 to .435 (w) and -.151 to .446 (b).

In order to determine the best set of physical predictors for TotIQB a stepwise regression was computed with TotIQB as the dependent variable and all five age-adjusted physical measurements as predictors. The plan was then to combine the best physical predictors with the blood gene factors reported in Osborne, Suddick (1971) to predict TotIQB.

For the white group face length, head length, head breadth and nose length all yielded multiple R s greater than .385. Three anthropological measures, face length, head length, and head breadth produced multiple R s above the cut-off point of .150 for blacks. Age adjusted head breadth was the best single predictor for blacks with a multiple R of .469. Before combining the best physical predictors with the best blood group predictors the selected age adjusted physicals were entered into a multiple regression equation involving only the physical measures.

Coefficients for the age adjusted physical measures are given in Table III. This table appearing in Part I is a bonus because the regression equations will appear again in Part II in which the number of subjects will be significantly larger making it possible to cross-validate the estimates generated by the regression equations. Suffice it to say for this group of 96 subjects the R s between the obtained IQs and the estimated

IQs from age-adjusted physicals were .491 for whites and .472 for blacks.

TABLE 3

Regression Equations for Predicting Mental Ability Scores
from Selected Body Measurements

White sample (54)

TotIQB = .063StdfacI - .001 stdhedI + .061stdhedb + .123stdnosln + 60.986

R2 R
.241 .491

Black Sample (42)

TotIQB = .137stdhedb + .025stdhedc + .036stdnosln + 57.433

R2 R
.222 .472

TABLE 4

Regression Equations for Predicting Mental Ability
from Selected Blood Group Frequencies
and Body Measurements

White Sample (N = 54)

TotIQB = 8.348Lea - .846K-10.768 Fya - 6.500Jka + 11.001A2 + .029stdfacI
+ .054hedln + .044stdhedb + .114stdnosl + 70.546

R2 R
.545 .738

Black Sample (N = 42)

TotIQB = 14.637s - 7.609Lea - 5.260Fya + 8.137Jka - 5.587Aone + 2.013B
+ .085stdhedb - .035stdhedc + .052stdnosl + 57.778

R2 R
.627 .792

In Table IV the blood gene factors from the Osborne-Suddick paper and the physical measurements are combined into separate regression equations for each race to estimate mental ability from physical characteristics only. By combining the new physical factors with the blood gene factors the R was enhanced to .738 from .491 for the white sample. For blacks the R for the physical measurements alone was .472. Combining the physical and the blood gene factors produced an R of .792. These multiple Rs predicting mental ability from only blood gene factors and anthropometric measures are remarkably high but will no doubt suffer shrinkage when cross validated against an independent sample. The reader is also reminded that the 96 subjects of this study were twins which would no doubt further reduce the magnitude of the Rs. In Parts II and III of this series of studies the subject numbers are greatly enhanced permitting cross-validation studies. No where in the literature can we find a combination of anthropometric measurements and blood gene factors related to mental ability. Previous studies of the genetic correlates of mental ability have been of three groups: In the first group are those investigators such as Leon Kamin, Richard Lewontin, and Jerry Hirsch who find the idea of human genetic research repulsive. They fault the method, the data and even the idea of the research in the first place. In the second group are those who have done their field work, collected original data and analyzed it carefully but find the jury still out. More research in the area is encouraged but caution is the watchword. In the second group would be Steven Vandenberg, John Loehlin, Louise Carter-Saltzman and Sandra Scarr-Salapatek. In the third group are those who are in basic agreement with Sir Cyril Burt who said that mental capacity is cognitive, general, innate and that these characteristics have been verified by statistical research. In this group would be found in addition to Cyril Burt, William Shockley and perhaps Phillipe Rushton.

The small samples in Part I of this study do not yield altogether convincing evidence in support of Shockley's H-Hypothesis. It is hoped that Parts II and III with much larger numbers of both blacks and whites will make possible

more reliable predictions of mental ability from physical measurements.

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EUGENICS REVISITED

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We are living in a window of history, perhaps the first such period when the law of the "survival of the fittest" is not applicable. This window has been caused by the growth of technology such that the rate of production exceeds population growth. Thus today almost all survive to maturity. Some threats to that window are well known and debated, such as population growth, nuclear holocaust, the depletion of energy and other resources, and ecological health. Nevertheless, they are openly debated, most are familiar with them, and they are not denied. For these issues a work of this scope would be lost in the sea of articles, speeches, and materials from groups organized to educate the public. The issues covered herein are also serious but are neither openly nor actively discussed nor is there any organized group seeking to explore these issues. The discussion of these issues is strongly suppressed.

This work covers cultural and technological trends that, at the very least potentially, have dysgenic as contrasted to eugenic effects. The maintenance of a healthy society, particularly under stress, depends in part upon the competence of its members. The loss or diminution of that competence decreases its ability to sustain itself in the face of this and the above listed threats. A related problem is that - particularly in a shrinking world - invidious cultural differences divide us, and are a source of conflict. This problem cannot be logically treated apart from the dysgenic trends mentioned above, and both are therefore included as matters of concern. The major issues are ethical, not scientific. The scientific portions of the argument are not generally germane to the major conclusion, which is that the subject is of sufficient importance that it should receive priority attention and open debate.

The purpose of this work is to show that eugenic solutions should be considered for two major problems facing our society: the slow degradation in our national intellectual competence due to a negative IQ/birth-rate slope and the existence of significant present group inequalities. Whether these solutions are found to be feasible and desirable or not, the hope is that with debate and consideration the chance is

significantly increased that realistic ethical responses to these problems are adopted. The point of view is that eugenic solutions might avoid a catastrophe in the future and perhaps provide modest tangible and intangible rewards in the present.

The long-term advantages are more obvious than the near-term advantages. The advance of technology is making an ability to master an extremely complex world essential in order to maximize the country's economic product. The ability to learn and adapt rapidly has never been higher in demand. The inevitable spread in human capability means that some are and will be seriously handicapped in this regard. The Marxist credo would solve this problem by simply dividing the fruits equally, irrespective of one's contribution. An inherent problem not solved by this solution is that people not only want to have a just share, but also like to think of themselves as contributors, as opposed to being part of a "drone" population. Whatever the advantages to posterity, however, as a matter of plain fact people are more strongly motivated by their personal, here-and-now, interests, and the interests of posterity some 300 years hence can be abstract at best.

The perceived benefits, therefore, to those now living are of great importance and are not insignificant to any group. A near-term intangible benefit is the satisfaction that comes with solving problems, even if that solution bears its greatest fruit some time in the future. While some debate is reasonable in this regard, the solutions recommended would concentrate on helping bring the unlucky groups up, closing the gap, rather than bringing the lucky groups up, increasing the gap between the most and least fortunate.

As in any major program, not everyone would participate directly. But in this case those that did participate actively would receive tangible benefits through the progress their children would make in terms of competence, maturity, and power. A new sense of community could be born, as patronizing, well-intended nostrums were replaced with a shared view of reality and a plan to change that reality for the better. Then the poor and unlucky could take pride in being the solution to the problem, not the problem.

Those groups that are currently the most fortunate would "lose" relative status in the pecking order. But that relative loss may not be very significant, as they would gain in "quality of life" factors. The willingness to engage in permanent meaningful solutions would make the country a better and happier place to live. Tangible benefits would include better security, better morale and sense of purpose, and a decrease in the economic and social costs of crime. This is not to say that we would have a perfect or "Pollyanna" type world, or that we would still not have accidents, sickness, jealousy, and similar human burdens. It would, however, be significantly better than it is now. The gains are not without cost, but the costs are largely overblown.

In spite of the arguments for eugenic solutions, there remain a large number of qualitative and quantitative aspects that should be defined first. One should move deliberately in approaching revolutionary social programs. In particular, a small-scale test program is proposed that could provide information not attainable any other way. In view of the extreme importance of this problem area, such a program can be justified even if a consensus does not exist on the need for or value of eugenic solutions. The purpose, in fact, is to provide better data upon which to base such an assessment.

Problem Statement

A basic problem is that we are able to remove much of the sting from "Darwinian fitness" for survival with the advance of technology; the side effects, however, are unexamined. "Fitness," at least for a while, is more nearly a matter of choice than competitive struggle. More widely available birth control is also a factor to be considered. Removal of the fitness criterion, however laudable and better from our personal vantage point, can have adverse effects upon society's genetic health. Discussion or even the admission of the existence of this possibility is heavily repressed.

Without the control from harsh selection for survival and without any compensation for any consequent effects of recent changes, our national level of competence is very probably

drifting on a downward slope. At the same time advances in technology and increases in the amount of information to be mastered seem to demand higher levels of intelligence for productivity. The problems, however, so seriously impact the future of our country and the world that they deserve serious consideration unless one can exhaustively prove that they do not exist. Also of great concern is that, in the current liberal view, the ethical response to these problems should be denial, as opposed to open debate. It is considered unethical and "racist" to broach the problem, let alone explore or study it. The range of opinions as to the seriousness of this problem is very large. One group sees our country headed for chaos, as the mean IQ drops some 10 to 15 points in the next 300 years. Their personal assessment is that the odds against this not happening, unless something is done to reverse the trend, is on the order of 1000 to 10,000 to 1. Other groups, however, seem to believe just the converse. It would seem, given the very serious divergence in these view-points, that the groups are either working with different data and/or have not taken the time and effort to communicate with each other. This work supports the position that there is a problem. With that belief, clearly one might be impatient with present inaction. One will never get action, however, until some kind of consensus is reached. For that reason, a satisfactory near-term goal is to open up discussion. That is a minimal ethical response for one who believes the problem to be serious.

Trends in the intellectual capability of a population are difficult to measure directly. Measures of intelligence are not precise enough to provide useful trend data in the short term. Long-term attempts suffer because they provide answers after the fact and because the results are confounded with slow changes in environmental factors. An indirect measure may be made by looking at the IQ/birth-rate relationship and calculating the downward drift. This, however, is subject to dispute on the grounds that, while other forms of life that we can experiment with are subject to the laws of genetics, these laws might not apply to humans.

The seriousness of the problem, however, should force one

to come to grips with the problem whether one can assess the size of the effect with mathematical certainty or not. A serious impediment to obtaining a rational assessment is that efforts to obtain data are not acceptable to those that wish to deny the problem on ethical grounds. Funding for research in this area is greatly curtailed or non-existent. Vining, Vining (1983), estimates that the drift rate is about one (1) IQ point per generation, or about 3.7 points per century, assuming an intergenerational period of 27 years. However, the problem is so serious that a permanent commission charged with making this kind of estimate should be formed to continually monitor "our genetic health." Such trends are dynamic and most accurately estimated by a program with continuity.

The question of the existence of differences in group IQ levels has much the same kinds of problems. Unambiguous mathematical certainty cannot be obtained because one cannot design an experiment in which the environmental variables are accurately controlled. Even were this possible, execution of the experiment would be highly unethical. Once again, however, the urgency of the problem requires a more pragmatic approach. We cannot afford to leave gaping wounds untreated because we cannot accurately assess the size of the wound. One can make the "racist" argument either way. One can claim someone is "racist" who admits to the existence of significant differences because this is pejorative to the unluckier groups. One can equally well argue that denial of the problem is "racist" because denial prevents cure, and would condemn any unlucky groups to remain so in perpetuity. One should expect isolated groups developing under evolutionary pressure to progress at different rates due to the various environmental and social conditions to which they were subject. To say that this is not to be expected is to say that evolution proceeds on a preset path, regardless of environment. Many, therefore, believe that differences are to be expected unless proof of equality can be provided. This argument provides no guidance, of course, as to the rank order of the various groups.

These arguments are consistent with the results of IQ tests,

correlations found between brain wave characteristics and IQ measurements, and mental agility tests where speed is the sole criterion of performance. An evenhanded and at all thorough exploration of this data is both too long for inclusion here and also not germane to the purpose. It is not germane because the arguments made against the proof of the existence of the problem do not deny the problem, but argue that it is not proven. This neither denies the problem nor its seriousness. In order to sensibly make an impact upon the conclusions of this work, one would have to show that the probability was very nearly one that the tenets advanced here were false. From the mass of contradictory studies available, developing that kind of precision is all but impossible.

For those interested, a more detailed discussion is included in Appendices A and B, together with references, as appropriate. These appendices, however, do not attempt to provide scientific proof, but rather provide a better sense of the arguments.

The ethical resolution of two very serious problems is proposed in this work:

1. The presumed existence of significant differences in intellectual capability between racial groups.
2. The presumed downward drift of the average intelligence in the US population due to a negative correlation between IQ and birth-rate.

By definition, the resolution of these problems involves a eugenic program of some kind. The recommendation made is that the problems be taken seriously and that programs be started to resolve the issues as a matter of urgency. In particular, a pragmatic small-scale experimental eugenics program is proposed as the only way to obtain valid and acceptable data in this controversial area. Any implementation should await the results of this and other studies.

The Vision

In this section the eugenic "vision" is described: what the goals and purposes of a eugenics program should be. It is, however, just a vision. It would only come to reality with some

hard work and sacrifice, and is therefore problematical at best. Nevertheless, it is good to have a goal. The most and immediate part of that vision would be the sense of rebirth and commitment that comes with facing a very difficult reality and developing a plan. Proceeding we may march forward to better solutions: solutions that bring affirmative action to an end because there is no need and that diminish the invidious differences between groups.

It does no good to try to turn back the clock, looking to a day when we can return to the hunter-gatherer society, no matter how correct are some recent assessments of the success of that form of society in providing an enjoyable life. In order to back down to that state would require a reduction of the world population by some incalculable fraction, and, without doubt, man would once again trod the same road back to where we are now. There are two major problems for which eugenics provides what might be called "robust" palliatives. By palliatives is meant that the human condition will always have hardship and stress. We can make things better, never perfect. By "robust" is meant that the palliatives address and change the core problem, rather than merely mitigating its effect. One of these problems is the fact that, in order to use the wealth of accumulated technological information which enables and supports our relative wealth, one must master that information. Those who are able to do so can be more productive. Our abilities to use that information differ, and this fact divides, as never before, our society into those that can make significant contributions and those that cannot. It does not markedly help to take the Marxist viewpoint that society should take according to ability and provide according to need. Apart from the fact that humans are just not that generous, the invidious comparison is still there, even if the approach could be made to work. Humans not only want worldly goods, they also like to see themselves as producers of that wealth. People do not like to be drones, living at the mercies, tender though they may be, of a loving or not perhaps not-so-loving superior group.

To provide an example, it was not many years ago that

ninety percent of the population lived on the farm raising food. The types of skills needed, such as hoeing potatoes, plowing, and similar skills required little in the way of memory, learning, and comprehension. For these skills, someone with an IQ of ninety would perform, after training, as well as someone with an IQ of one-hundred and sixty. This is not meant to deprecate the competence of our ancestors, as judgement was always useful, as in deciding which field was in greater need of tilling, the management of the business affairs of the farm, and the like. Nevertheless there is a very significant difference between the intellectual requirements for most farm tasks and those prevalent today. The management aspects of the farm took a relatively small part of the day, and those not gifted could more easily compensate by working longer at those tasks.

One of the simplest examples of the proliferation of learning requirements encountered today is found in the secretarial role. It was not long ago that the technical requirements for secretarial work consisted mainly in training one's fingers to automatically strike the right key. A typical secretary today must struggle with a word processor, with some 100 to 200 commands to be memorized. Experience has shown that it takes about two years for secretaries to become really proficient on a new word processor, and often, due to mergers or similar considerations, new word processors are introduced. The fast learner that can adapt has an obvious advantage.

It is estimated that an IQ of some 113 points might be regarded as a minimal requirement for the practice of medicine. Actual requirements to be in the mainstream are of course higher. However, for the minimum requirement, and with a population average IQ of 100 and a standard deviation of 15 points, some 19 percent of the population would be above this level. Clearly, some eighty-one percent of the population does not have the option of being a physician. The competition is therefore limited, and those fortunate enough to have that capability have, as it were, a corner on the market. Suppose that the average population IQ were raised to some 130 points. Then the minimal present requirement to be

physician would be met by some eighty- seven percent of the population. Then intellectual requirements would count less in the selection of physicians. Some who were qualified to be physicians might choose some other endeavor which was less interesting, but by the same token, being unpleasant to the great majority, paid more. If that person valued prestige or a challenging career more than money, then that option would also open. Thus the larger the percentage of people with intellectual skills necessary for the more demanding occupations, the less the compensation would differ from the average. Pay would be depend more upon less invidious factors, such as individual preferences, willingness to work hard, and interpersonal skills.

This is not to imply that we would or could ever get to the point that being more intellectually capable was not useful and desirable, and that those who had such a capability were not fortunate. But the impact of that comparison could be measurably blunted, and a much smaller portion of the total population left without options.

The above illustrates the general principle, but there is another factor that makes this problem much more serious. That is that different ethnic groups in this country have different group average IQs. This makes what is already a serious problem much worse. No members of any group like to think of themselves as less capable than those of any other group. Running through the previous exercise, but taking into account differences in group average IQ, paints a very stark, harrowing, and even more difficult reality to accept.

Taking the case of the physician, above, with the minimal IQ of 113 points. If the average IQ of a group were 110 points, then the fraction with an IQ above the 113 point threshold would be some 40%. Clearly, the ten point lead already has made a sizable difference in the fraction of the population that has a chance at this profession. Take on the other hand a group that had an IQ some 15 points below the average of 100. Only some 3.1 percent of that population would be so qualified. There are two ways to react to this reality. One of them is to deny that such group differences exist. In the

short-run, this is not a bad gambit. But note that it forecloses on any chance of an improvement in the situation. If the thesis is true then facing reality and doing something about it is much more productive than denying reality. Even if the picture turns out to be inaccurate, the penalty for trying is small. If the picture is accurate, at least one can make an informed decision.

The eugenic vision requires that all groups are sufficiently mature to face that reality so that we can do something constructive about it. With the general acceptance of that reality and the development of an appropriate plan, it will no longer be necessary for groups to "fake it" in their relationships with each other. And as time passes, all groups will take pride in the gradual resolution of that problem. Those most heavily pressed can hope for a decrease in that invidious difference of some three to four IQ points per generation of about thirty years, or about six to ten in a lifetime. That is a remarkably high rate. Moreover, the participants in the plan could see an improvement in the capability of their children of some 10 IQ points over what it would be in the absence of a eugenics program. This would provide them, statistically of course, with a much greater range of vocational options than were available to their parents. As differences in mean IQ between the various groups begins to decrease in significance, perhaps intermarriage between groups will become more common. Then boundaries between groups will blur, and eventually make such distinctions too complex to track. None of the above is to suggest that this resolves all problems. There are those that believe that a homogeneous society is uninteresting and dull, and would prefer the problems associated with prejudice to it. But what is really wanted is a prejudice-free world with all the benefits of our separate special groups as well. There is some question whether that is feasible, but that is not to argue that reducing the differences in capability, facing reality, and striving to live and work together more equitably is not better than the current situation.

One might not unreasonably ask, if racial differences were made inconsequential, why could we not live comfortably

together with all our other differences? Perhaps we might. On the other hand, group competition for survival may be a human trait that is difficult to ignore or eliminate. It is perhaps possible that we can rationalize it away, but in spite of our best efforts it would probably remain just under the surface. We should try to build a pragmatic system that both recognizes that we, as humans, have built-in tendencies to prejudice in our own favor, but that we also have the capability to recognize that those are "nature's" interests, not our own.

Our children and our children's children will have to make that society work, and whether it leans to the monolithic society where there are no significant divisions on the basis of race, or whether it is a multiracial society, but with a better balance and understanding than we now have, is something that we can neither predict or control. What we can do, however, is make some small progress in making either of those options feasible for our progeny, and certainly better than what we have today. From our selfish standpoint, doing what we can do for them and the joy that it would give to our lives is our present satisfaction – and not at all an insignificant reward. All of the above, however, is a "vision". To translate that vision into "reality" is a formidable task.

Philosophical Basis

One reason that eugenics has such a bad name is that it has been accused of being an excuse for the aggrandizement of the strong and lucky at the expense of the weak and powerless. As will be discussed later, there is no good reason why eugenics should not be used for the benefit of all segments of the population. Survival through "Darwinian fitness" in the course of evolution is nature's eugenics program, but is excused as a matter of "necessity," an impersonal choice. Unfortunately for the human race, failure to continue the selection process will result in the degradation of our skills acquired through that painful process.

"Classical" eugenics would select those with strong intellectual or other traits, which clearly in the end results in the rejection of those without. Were we objective thinking ma-

chines, this would not be a problem. One could then realize that if one did not measure up to the required standards, our rejection was for the good of society and rejoice in that. People, however, are not machines; as a result of our evolutionary origins, we feel pain at rejection, and struggle for individual and group survival. This poses an ethical dilemma. To manage our society without a selection process is comfortable in the near-term, but the long-term result can be catastrophic. While there is no clean way out of that dilemma, nevertheless some resolutions are markedly better than others.

A major part of one's pain at rejection and of our drive to continue our own genetic line is due to cultural factors. This might be expected because of the high correlation between culture and genetics. We belong to a gene pool which is usually also shared by those who comprise our immediate society. In a pre-modern society we would get both our genes and our culture from both from our parents and our kinship or ethnic group. The "straw man" resolution of this dilemma attempts to blunt the force of that rejection by limiting it to the minimal rejection possible and reinforcing cultural acceptance, both of one's self and one's group. The genetic replacement (rejection) of the father by a donor chosen from his own group is an engine that could accomplish the eugenic purpose. Since individuals identify with specific groups, the individual's lineage may be continued by selecting the donor from the same group. Meanwhile, the eugenic purpose of promoting genetic characteristics that are better adapted to the current need is accomplished.

Minimizing the cultural deficits would include allowing the program participants to have a normal size family, instead of smaller or none. Positive cultural benefits would be the improvement in their children's life chances by a significant increase in expected IQ, some 0.6 to 0.7 standard deviations, as well as financial rewards. Cultural advantages for other members of the group, non-participants, would be group progress up the ladder to greater average intellectual competence, as opposed to "deselection" in a positive/negative eugenics program.

From a cynical point of view, the program proposed "cheats" by providing selection after all, regardless of attempts to make it as painless as possible. And one can easily conclude that any rejection is immoral. On the other hand not doing something will just pass the problem to our children and children's children to solve, and with much less margin to work with. This is also clearly immoral. Morality is codified ethics, useful for handling the majority of such questions. But when one faces a situation where our morality rules give contradictory advice, one must fall back on an analysis of the ethics of the situation. At a minimum we should make that ethical choice in the light of the total consequences. The purpose here is provoke open debate to the end that at least our society is able to make that judgement wittingly and intentionally.

Eugenic Solutions

Webster's New Collegiate Dictionary defines eugenics as "the science which deals with influences that improve inborn or hereditary qualities of race or breed, especially of the human race." The meaning that comes to most minds when the term "eugenics" is used, however, is that of a "scientific cover story" used by a powerful group that wishes to assure its dominance over a group of lesser power by diminishing their numbers under the guise of eugenics.

Webster's definition is vague, and the usual "cover story" definition above, which admittedly contains more truth than it should, is scarcely a definition that is consistent with the thrust of this work. A better definition for the purposes at hand is the following: Eugenics is the name applied to social programs established for the purpose of either improving the ability of the human population to adapt to new or stressful environments or to prevent the degradation in those capabilities due to artifacts or characteristics of the social system.

Eugenics is intentional and purposeful, as apposed to "evolution," where selection and "improvement" proceeds by the selective survival of those with Darwinian "fitness." It is not clear whether social artifacts that either have eugenic or dysgenic side effects would call for such a label. A knowledge-

able and witting society, however, bears responsibility for the results, regardless of the label used. *E.g.*, for such a society to select Darwinian "survival of the fittest" by default is, in effect, indulging in an extremely cruel form of "eugenics."

There is a school that argues that one does not need genetic eugenics, but that our problems can be resolved using environmental eugenics. That is, if we can build a society in which the development of human potential is optimized, then we will make enough progress based on the existing genetic base to solve our problems. The most fundamental argument against this school is that the amount of growth in capability is limited, and does not increase in time. Each increment in genetic capability, however, provides a new base. If each generation builds a bit on that base, much more significant changes can eventually be accomplished. Another problem not directly addressed with environmental eugenics is that such solutions found may be applicable for all groups, rather than those most in need. And while this may make things better, it might still leave any existing invidious group differences undiminished.

One other aspect should be kept in mind. Initially, in a eugenic program, one may select from an existing set of genes. After such selection is complete, however, one must wait for chance mutations which become established very slowly. Thus there are undefined limits as to how far one may proceed. Given the wide distribution in intelligence in existing populations, however, it is reasonable to expect that those limits are high enough not to be of concern at this time.

A common charge against Eugenics is that no one knows what the objective should be. One "cannot measure intelligence" and intelligence is multi-faceted, if it exists at all, etc. Although in the short term the question can be bypassed, in the long term it really comes to this: Is it possible to devise a measure that accords better to human needs than "Darwinian fitness"? "Darwinian fitness" is even more difficult and elusive than intelligence and depends upon both chance and a strong sense of self-preservation, often at some peril to society. It is thus a poor selection criterion, and terribly ineffective over short periods of time. While there are many that might argue

for that criterion in the abstract, it should be clear that those exposed to that criterion might think that death was a bit more obtrusive than family-size limitation or a carefully planned eugenics program.

Theoretically, we may one day be able to "construct" genetic material in a laboratory, which would open up new genetic possibilities. It is not clear, however, that this would significantly alter ethical concern regarding the use of donated genetic material. In either case, at least one partner is "deselected," or perhaps has his or her genetic material "repaired." The use of naturally occurring genetic material has the advantage of safety; one is using genetic material which has stood the test of time. It is also a blunter instrument, which prevents detailed tailoring of the product. The latter is perhaps more to be feared, as an authoritarian state could greatly abuse this gift in various ways.

Since detailed control over inherited capabilities is not yet here and ethically inconsistent with the intent of this work, consideration will be limited to selection involving naturally occurring genetic material. In this case two clear options exist, the selection of genetic material by selecting (or deselecting) the person carrying that material and the donation of genetic material by a person known or assessed to have a high probability of possessing genetic material with the desired characteristics. The former option, to many, appears less artificial, and therefore the lesser of the two evils. However, as discussed below, it is not that simple.

For the case of the selection of individuals for reproduction, two generic approaches are available, positive eugenics and negative eugenics. In the former case, persons judged to possess superior genetic capabilities would be encouraged to have more children. In the negative eugenics case, those judged to be less likely to have superior genetic capabilities would be discouraged from have children, or denied the right. There are marked differences in the two approaches in the short term. In the long term, however, they are almost identical. The reason for this is that there are soft – or possibly hard – limits on the total population. Thus, after a time,

encouraging one group to reproduce at a greater rate subject to an overall control on total population implies some means of reducing the reproduction of those less favorably endowed.

There are very real short-term ethical differences between positive and negative eugenics. In the case of negative eugenics those unfortunate enough to be unlucky are told, in effect, to "get lost" in so far as parenting the next generation is concerned. In the case of positive eugenics, the eugenic purpose for the disadvantaged would be obtained by the trickling down over a period of time of the eugenic progress obtained.

Another problem is that the incentive necessary to encourage the presumed competent to have more children might be more expensive than that needed to discourage the disadvantaged.

Clearly both positive and negative eugenics have serious negative implications. On the other hand, to ignore this problem might have extremely negative implications for our progeny. Our task, however, is to look at all options, and choose the least obtrusive one. The problem with negative eugenics, as described above, is that all the burden falls on a few (or not so few as it may turn out.) Those selected are not only excluded from the selection (rejection) process itself, but must also forego the pleasures of family-centered life. While, in principle, one could provide monetary compensation, it is difficult to see how any such compensation would ultimately succeed in redressing so serious a wrong. This would be true even if participation were "voluntary." Selling one's birthright for a life of luxury does not seem to be conducive to a contented life. Moreover, it is difficult to see how those making the bribe would be all that pleased with themselves either. What is needed is a plan in which participants selected are recognized and rewarded as positive contributors and with more than financial incentives.

An option not yet discussed is the use of donated genetic material. Such donated material might be used with participating families in ways that respond to most of the above objections. Suppose, for instance, that children in selected disadvantaged families were sired by artificial insemination,

with the donors being selected from the participating family's racial and/or ethnic group in such a way that the children would have a high probability of being significantly more capable. The families would be recognized as capable parents, as active participants in the program, have children that would be able to better care for them in their old age, make a direct and visible contribution to society, and justify, not as a bribe, financial and economic assistance as a compensation for their participation. It is still artificial, and not exactly ideal, but what one is searching for is the best of the alternatives, or perhaps the least unsatisfactory.

One of the objections, or more properly, suggested reasons, why eugenics using donated material will not work is that the men are "left out of the picture" and would not cooperate. It is difficult to predict, in a society which had come to regard this subject much more philosophically than we, whether the merits of having children with much greater capabilities than they otherwise would and the pride and pleasure generated by the at-long-last progress of one's group up the ladder, not from charity or love, but competence, would compensate for the natural desire for one's own.

Another possible choice would be to have the donated genetic material be on the mother's side, an ovum. A merit to this approach is that the mother's part in the process, apart from conception, would be the same as if the child were actually her genetic child. One might expect that the bonds of motherhood would develop as for her own. If the child were sired by the father, then he would also share. This arrangement would thus share, more nearly, the giving between the parents, and both would have a real live stake in their progeny. Arguments against this approach are "mechanical," among others. Artificial insemination is a standard and not uncommon practice, whereas implantation of ova a much more complicated procedure. Also, the process is much more obtrusive from the standpoint of the donor. Both have the same general results, and time and experience is the best judge. The use of donated material from both the male and female side, however, would appear to be very obtrusive. It corresponds to a

complete rejection of both partners in the marriage, except as breeders. It would permit "progress" to be made twice as fast, almost, but the children would be quite out of place in the family, in itself very obtrusive. It would be better to wait twice as long. What is important is not to get there in a hurry, but to get there.

In summary, there are very few eugenic options, and none that are not pejorative in some sense. It is a matter of selecting between a set of undesirable alternatives as a practical necessity. However, this is not a unique situation. There are other realities that man must face, such as death, for instance. Unpleasant as the thought may be, it can not be denied. The necessity for us to consider this problem in realistic terms is just one more in the total set, and perhaps not the worst one. The thing that distinguishes it from the others is that it is so easily put aside, as the major direct beneficiaries are yet to be born and have no present voice.

The above discussion has covered eugenic possibilities as if they were mutually exclusive. There is no reason to exclude the consideration of plans in which participants could chose those options which seemed least obtrusive or better from their point of view. It is important, however, to establish that there is at least one such solution which is acceptable enough to warrant consideration. One other approach to eugenics is proposed by Osborn, Osborn (1951,1968). His approach is to create an environment in which people will be motivated to follow eugenic principles voluntarily, through education, cultural pressure, and training in values. Whether such a broadly-based, generalized approach would be successful or not is difficult if not impossible to say. However, the actual implementation would involve individual decisions on the part of parents to practice one of the above methods. They could decide not to have children, which is just the "voluntary" practice of negative eugenics. In order to support such "voluntary" decisions, society would be mobilized to educate and motivate people to make such "independent" decisions on their own. It is unconscionable for society to encourage and train people to make sacrificial efforts in society's behalf

without recognizing and sharing in that burden. To the extent, however, that they took this recognition, as for instance by providing additional relief support for such voluntary action and institutionalized it, such a program would share the characteristics of an explicit eugenic program.

The next section will discuss the question of potential or useful solutions to these problems. However, some recognition should be given here to two social problems, the resolution of which might not only ameliorate existing dysgenic tendencies, but might also be considered to be worth while in their own right. In part, the "dysgenic" engine is driven by two features, both of which can be viewed as pejorative to women. One of these is the fact that women are handicapped by their child bearing and nurturance role in the competitive world of business. Child care can be very expensive. Child care costs thus provide them with a motivation for having a smaller family than they really want, but for their business interests. On the other hand, at the other end of the ability spectrum under current welfare practices, women receive financial incentives for having more children.

In attempting to resolve these problems, one encounters serious ethical dilemmas. For example, a professional mother might require the best of child care and support for college for her children in order that the incentive be meaningful to her. The more the mother earns, the more it costs to provide a potent incentive. At the same time, one either reduces child support payments to the poor to reduce the positive incentive to have children or pays more under the stipulation that they have fewer children. To say the least, the treatment appears to be far from evenhanded. Thus when one looks carefully at the problems one encounters in practice, removing these disincentives for dysgenic tendencies is not at all straight-forward.

But that is not why these approaches are not discussed in more detail in this paper. The major reason for that is that while one might be able to hold the status quo with an unimaginable bit of luck, it turns out that these approaches would be inappropriate to resolve the problem of group differences. The thrust of this paper is that ethics requires the

satisfactory resolution of both problems, not simply one or the other. Holding the status quo is not enough. It is better than nothing, but only the callous could call it satisfactory.

There is another difficult ethical problem. The practice of eugenics is sufficiently subject to abuse and fraud that some public controls should be sanctioned and supportive of those wishing to pursue this approach, for whatever motive. Those that are not supportive of the idea that we should take eugenics seriously and therefore would not support such public sanction and control, in a real sense are denying the right to those that might wish to practice eugenics. From this standpoint the burden of proof that eugenics is counterproductive should fall upon those opposed, rather than that those in favor should have responsibility to "prove" that it is both useful and ethical. This raises the following questions, can a majority group ethically deny an unlucky minority group the benefits of a eugenics program which has negative short-term consequences, but showed promise of significant long-term productive results? Who speaks for the members of the unlucky group? Is it a democratic process determined by a political process, or is it a right that any fraction, however small, of the unlucky minority should ethically have? In other words, should this be a right that attaches to individuals or to groups?

Comparison of Eugenic Approaches

Eugenics is selective and thus painful to some. It is both politically necessary and ethically desirable to minimize the pain of any such process chosen by society. From the selfish point of view of the living, "none" would seem to be the best. The burden is immediate but the tangible gain belongs to the future. An intangible present benefit could be the satisfaction that comes with solving problems. A more significant advantage to participants is the brighter future for their children. The purpose here is to compare the impacts of several approaches using derivations described in Appendices C which provide a more complete technical definition of the model implementation used for the calculations.

The relative merits of positive and negative eugenics used

both alone and together are considered first. See Figure 1. The horizontal and vertical coordinates define the fractional changes in children per family for negative and positive eugenics, respectively. These changes are assumed to be from a replacement rate of two children. For ordinates of 0.5, for example, the positive eugenics cohort would have 3 children per family on an average. The negative eugenics cohort would have one child per family for the same conditions. The eugenic cohort sizes are assumed to be the top and bottom 30 percentiles ranked by IQ. The dashed lines show constant values of IQ change each generation in fractions of a standard deviation as a result of the eugenics process. The solid lines show the fractional increase in the population size each generation, typically 28 years.

For example, suppose that the goal is to increase the IQ of a group by one standard deviation, about 15 IQ points, in 10 generations. The combinations of positive and negative eugenics achieving this goal are shown by the dashed line labeled 0.1. This is obtained by dividing the goal of one S.D. by the number of generations to achieve that goal. For a no-growth assumption, these levels would be plus or minus 0.288. This would give typical numbers of children of about 2.58 and 1.42 for the positive and negative cohorts, in that order.

Negative eugenics can be avoided and still achieve the same gain in IQ. One could do this by asking the positive eugenics cohort to increase their family size to an average of 70 percent or 3.4, assuming that the negative cohort had children at the replacement rate of two. The group would grow by a factor of approximately 1.21 per generation. The overall growth is obtained by raising that factor to the tenth power, or 6.64. If negative eugenics alone were used, the group size would decrease by a factor of 0.853 to the tenth power, or 0.203. It is clear that absolutist strategies interact with population control. Thus, a balanced program which avoids the population problem has much merit. It can be shown that the minimum population change is associated with long stretched-out programs. This population growth for a positive-only eugenics

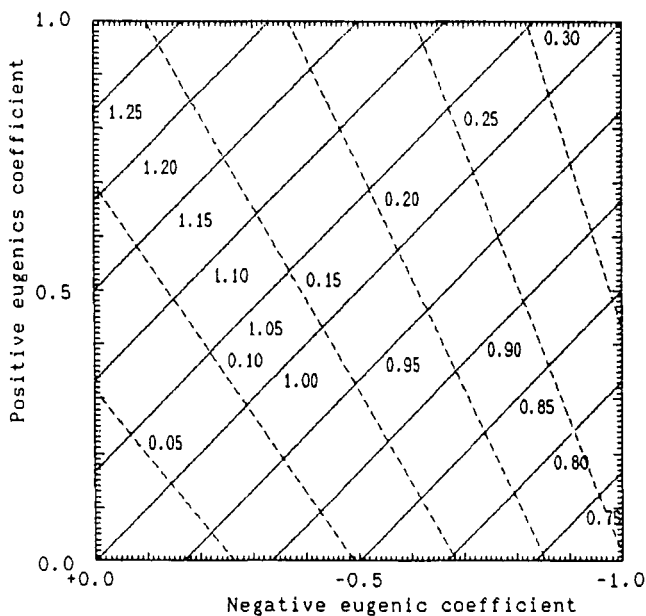


Figure 1. Gain in IQ and fractional change in population per generation. (Solid lines are population multiplier, dashed are IQ normalized change.)

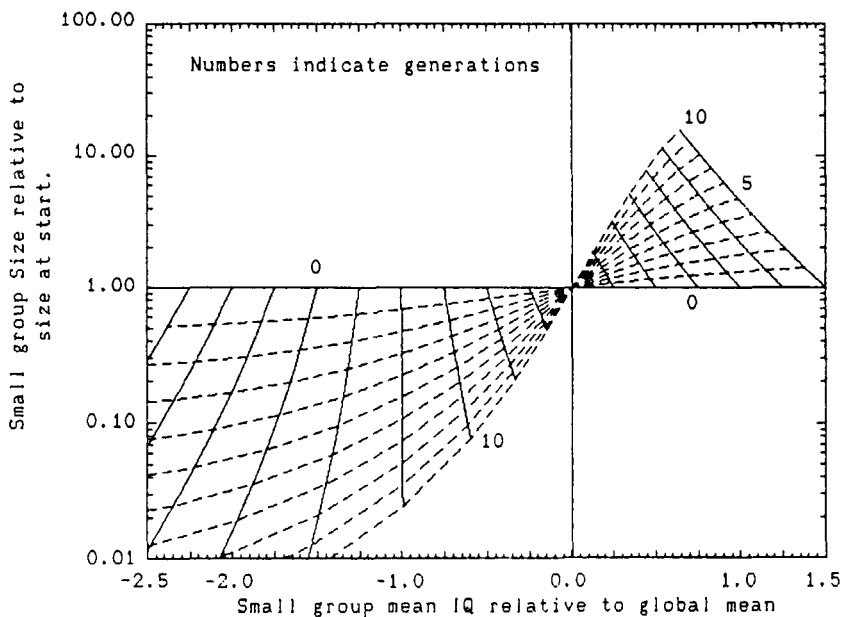


Figure 2. Effects of small non-mixing group under individual-based eugenics program. Groups start with size normalized to 1 with offsets from the global mean.

program is given by:

$$G = \text{EXP} ((0.8629*S)/H)$$

where S is the targeted number of standard deviations of change and H is the heritability. For the example above, the minimum gain is 5.62 assuming a heritability of 0.5. Clearly, positive eugenics programs with no negative components interact so strongly with the population problem as to be impracticable. If, of course, the size of the positive eugenic cohort family is increased to compensate for a higher than replacement rate by the negative cohort, the increase would be even greater.

The above discussion looks at the group out of context. If the group is part of a mixed society and if that society has a eugenics program that does not take group membership into account, group interests are not well served. In order to illustrate the size of this affect, Figure 2. has been prepared. The figure assumes that the group under consideration is much smaller than the reference group. Thus changes in group size will have only a small effect on the global averages. The assumption is that if this simple model reveals problems, a more exact simulation will show similar effects.

The vertical axis in Figure 2. represents the logarithm to the base 10 of the gain or loss in size of the small group as a result of this type program. The horizontal axis represents the gain or loss in IQ in terms of standard deviations compared to the reference group, which group is pursuing a balanced positive/negative eugenics program. The average number of children are 1.36 and 2.64 for the negative and positive eugenics cohorts, respectively. All cases start with size normalized to one (1). Groups which start out ahead of the reference group drop back gradually towards the reference group level in IQ and increase in size. Groups which start out behind also drift in IQ towards the reference group but with decreasing size as long as they are within one SD of the reference group IQ. If the small group drops more than one SD behind the reference group, it gets further behind and loses population

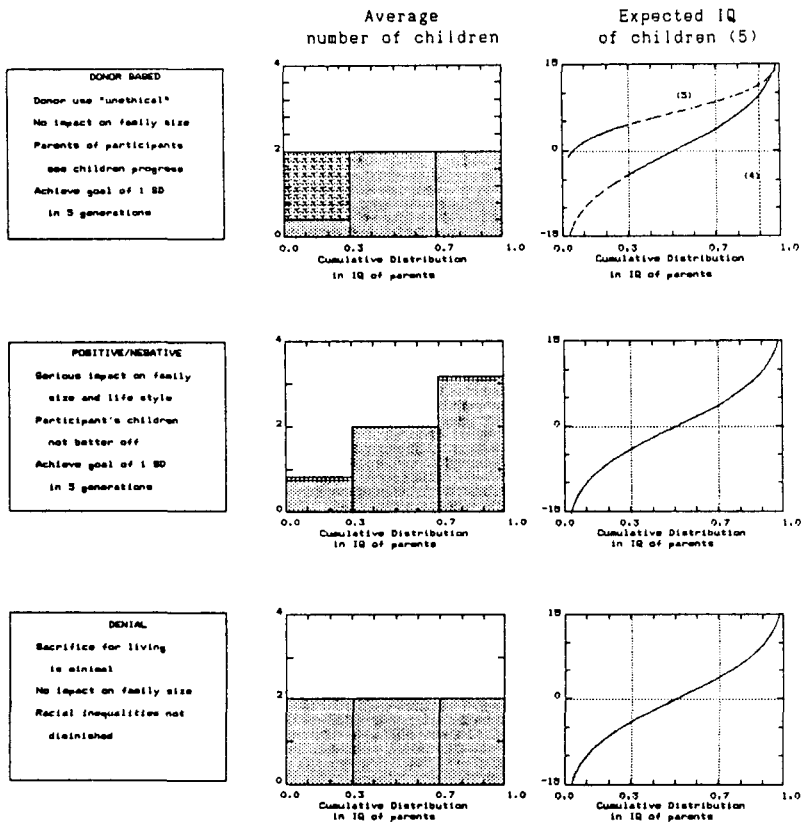


Figure 3. Comparison of three approaches to problems posed.

NOTES:

- 1) Donor-based and Positive/Negative goals are 0.175 SD/generation
- 2) Natural children shown gray.
- 3) Eugenic children indicated by mottled pattern.
- 4) Donor cutoff limit.
- 5) IQ of "eugenic children" shown for comparison.
- 6) Assumes:
 - * Heritability of 0.5.
 - * No birth-rate/IQ correlation.

rapidly. For the negative cohort, such severe changes in group size might raise the question of whether this was a eugenics program or a genocidal one.

On the other hand, using group-based programs means that some members of one group might be denied entry into the program even if their need (IQ) were lower than that of many participants in another group. It is difficult to claim that that is exactly fair either. There are no easy solutions to these problems. To find the best compromise will require detailed discussion and debate. Such, however, are proscribed by current social policy.

Figure 3. summarizes three choices from this section. Positive or negative eugenics used alone is not included because of the strong coupling with the population problem. The boxes at the left define the major features of each approach. The central column illustrates the family size implications and the last column the mean IQ of the children in each cohort. In the first example, DONOR BASED, the IQ curves apply to the participants, rather than the average of the entire cohort. These figures are for an assumed goal of 0.175 standard deviations per generation. The obtrusiveness level represented by the participation levels can be traded against a program of longer duration. The total participation integrated over the life of the program, however, is approximately proportional to the gain achieved. The benefits, however, are postponed. The last column illustrates the expected IQ of the children as a function of the cumulative distribution of the parents average IQ. This coordinate is used in place of parental IQ as it enables visual estimates of the averages, since each increment of the horizontal axis corresponds to the same number of people.

All options pose problems for some group. The use of donors is quite objectionable of itself. Asking the unlucky to restrict family size in a balanced positive/negative eugenics program, yet see no progress for their children, is also difficult to accept. Denial of the problem has small tangible penalties in the near-term. Asking the unlucky groups to content themselves with their lot in perpetuity, however, is not very

ethical either. Rightly or wrongly, our society currently seems to strongly favor denial. Perhaps it is only coincidence that this is the solution that postpones the problem for someone else to solve.

System Design

The previous section considered different types of eugenic systems. As mentioned therein, none are very palatable. Doing nothing is not palatable either. Before giving the detailed simulation results, this section will provide a broader overview defining some general limitations.

Figure 4 illustrates graphically some of the assumptions made in generating the simulation results given in this and the next section. The upper boundary of the plot represents the distribution of the birth cohort as a function of the IQ of the parents. This is assumed to be a Gaussian distribution multiplied by a factor $(1-kx)$. Here x is the IQ of the parents and k is a constant such that the product kx is small as compared to the standard deviation. Under these conditions, this product is a close approximation to a Gaussian distribution, but with a shift in the origin by a small amount in the direction of the positive tilt of the IQ/birth-rate slope. The areas identified as A, B, C, and D represent portions of the population that are treated differently in the analysis. The area A represents that portion of the population that qualifies for participation in the eugenic program but chooses not to participate. The area B represents those that both qualify and participate. The large portion C represents that part of the population that does not qualify for the eugenic program and includes the non-eugenic children of the donor cohort. The area D represents the donor cohort. Donors are randomly selected from this group in the model for participation in the eugenic program.

The average IQ before multiplication by the heritability is determined by calculating the first moment of each area representing the population in the child cohort and adding. This result is normalized by dividing by the sum of the areas, representing the child population. The eugenic population, however, is a special case. Here the average of the first

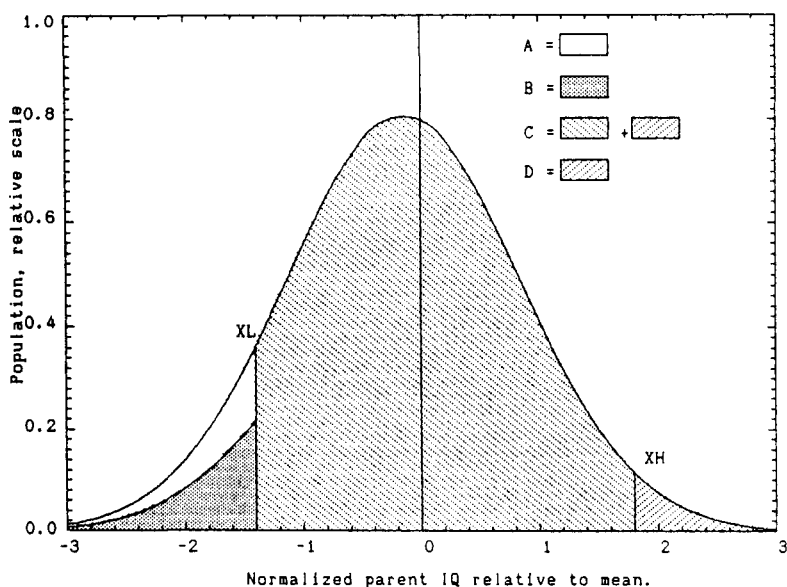


Figure 4. Portions of population used in the analysis.

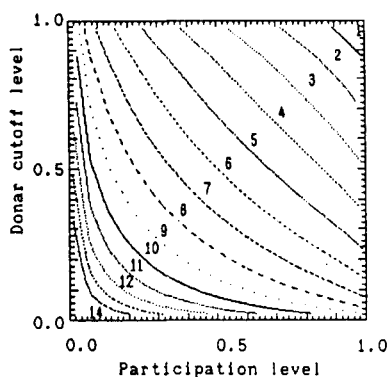


Figure 5. Eugenic cohort mean IQ gain as a function of donor and participation levels

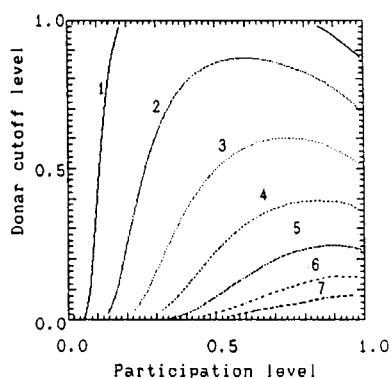


Figure 6. Population mean IQ gain as function of donor and participation levels.

moments of the eugenic (B) and donor (D) areas is obtained, but the latter is weighted by the area (B). The model used in the next section also assumes that the eugenic cohort has children at a replacement rate. This is mentioned only for completeness, for in practice it has only a small effect.

A very fundamental relationship of concern is the eugenic gain in IQ for the children of the participants per generation as a function of the level of participation and the donor thresholds. Figure 5 shows the results of this simple model to illustrate the general results. In this figure both the donor and participation bounds are defined by the fraction each group represents relative to the total population. For this figure, it is assumed that all those qualified do participate. The gain is a symmetrical function of the two thresholds, with maximum gain corresponding to low values of participation and high thresholds or low participation levels for the selection of donors. The high threshold restricts the size of the cohort from which donors are drawn. The eugenic gain depends upon the difference between the participant and donor IQ's, and using the model described, this difference is maximized by moving the participant threshold lower and the donor threshold higher.

For both cases, however, there are reasonable limits. In the case of participants, lowering the threshold decreases the participation level. This, in turn, reduces the overall gain. For the case of donor selection, it is not desirable to utilize too small a base. There may be some correlated trait associated with the extreme tail of the high IQ group that is unfavorable. Where the threshold should be set is an open question. From the standpoint of this paper, however, it is not a significant variable. Extreme values are not required. This set of curves is germane, however, as it defines the IQ gain as seen by the participants, which could be an important motivating factor. For a donor threshold which includes 10 percent of the male population, the gain in IQ per generation varies between 13.5 to 7.5 for participation levels ranging from 0.1 to 0.9. Thus this is not a sensitive parameter.

Figure 6 corresponds roughly to the previous one, except

that the gain plotted is now the overall group IQ gain. Without participation, there is no gain. For high donor thresholds, the gain is roughly proportional to the participation level. This means that, for a given IQ goal, getting there takes roughly the same amount of "obtrusiveness" regardless of the participation level. The higher participation level gets there faster, which is by some measures significantly more efficient. These last two figures do not include the effect of a slope in the IQ/birth-rate relationship.

There are two problems with trying to move too fast. One is that there is some limit to the amount of obtrusiveness that a society can or will bear. Perhaps it is even lower than that required just to stay even or zero. Another problem is that the greater the participation level, the less the program brings group IQ's together.

With the present model, low participation levels specified by a common IQ threshold for all groups result in significantly higher participation levels in the lower groups. As their IQ means rise and approach that of other groups, all groups begin to rise, slowing the convergence as participation is shared more evenly between groups. Figure 7 shows a plot of how the total spread in IQ changes over a 300 year period for nominal conditions. With no program, the difference is large. The minimum occurs with a participation level between 0.2 and 0.3 and increases again at higher levels. The increase is due to the fact that at very high levels saturation takes place and all groups more evenly share in the progress. The data for this plot are from the same source as Figures 10 through 13 in the next section.

Another way of summarizing the data is shown in Figure 8. Here the predicted terminal average IQ of the lowest group and the overall average is plotted as a function of the participation level for a typical case described more fully in the next section and, again, corresponds to results shown in Figures 10 through 13. No participation has dire consequences unless the model assumptions are changed. The curves show that the dysgenic effects of the IQ/birth-rate relationship can be compensated by a participation level which reaches 0.2 at 300

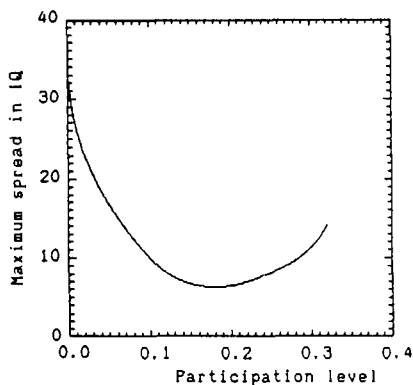


Figure 7. Maximum spread in group IQ at 300 years as a function of participation level.

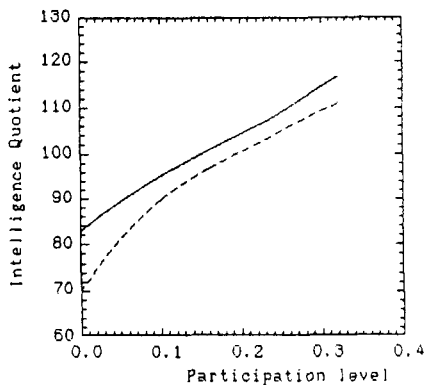


Figure 8. Terminal IQ for average and lowest group as a function of participation level.

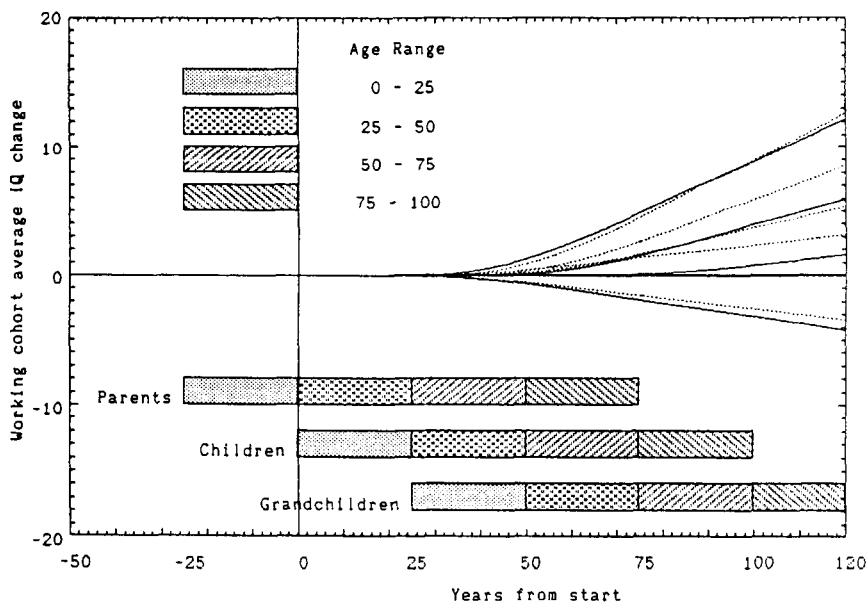


Figure 9. Illustration of tangible benefits of eugenic programs to various age cohorts.

years. This corresponds approximately a 0.1 level at a constant, as contrasted to an increasing intensity, with time. If some means (which would be, in effect, another eugenic program) the IQ/birth-rate correlation could be reduced or made positive, this would have the same effect. These curves also show the saturation effect of a high participation level which decreases the amount by which group IQs are brought together.

A different strategy to that described above which emphasizes individuals explicitly programs group participation levels so as to assure convergence to common IQ average results and maintains it there. The algorithm rank orders groups according to average IQ, and then assigns participation levels such as to bring the groups together. The results of such a simulation are shown in the next section, Figures 18 through 21. Unless one wishes to apply dysgenic means to decrease the higher-level group IQ averages, such a scheme implies a constant upward drift or movement of the overall group IQ mean. Admittedly there are no clear cut or obvious best compromises between the competing interests.

The gains to the initiating cohort, tangible and intangible, are of central importance. Tangible rewards, for instance, might be represented by the higher standard of living supported by a more competent population. How fast, optimistically, could results "trickle down" to the originating cohort?

One might make a first start at this by assuming that tangible results are obtained when the higher IQ cohort begins to enter the work force. In order to estimate this effect, the average change in work force IQ as result of the eugenic programs as a function of time for various assumed conditions has been plotted in Figure 9. Against that plot are shown typical ages for the first participant parent, the parents' children, and the parents' grand-children. The age ranges, of course, will be only approximate, as few children are born at the "average" time. It can be seen that the initiating parents will seldom see an overall gain by this measure to reward their contribution. If such an immediate tangible gain is necessary for acceptance, and we are unwilling to act in behalf of our

progeny without such reward, there is no hope. The several plots are based upon a wide range of parameters to include a program that has a participation level of 0.8. The major point is that both the eugenic effects and the dysgenic effects have associated time lags that cannot be compensated for by more intensive programs. The most sharply rising curves are those that assume instant starts and these are totally unrealistic.

On the other hand, on the personal side, the individual tangible rewards are not insignificant for participants. Having children with significantly greater chances of being successful in life is very rewarding as illustrated in Figure 5. The sense of pride and accomplishment that comes with *really* solving tough social problems can be a powerful motivating factor. On the more pragmatic side, if society were willing to reward participants financially with an amount roughly corresponding to the projected reduction in welfare costs due to the average higher productivity level of the children, as a "something for something" payment, rather than a bribe, then it might just all fall together. Although future generations will all benefit in the long-term, most of the near-term tangible benefits would accrue to participants. Pressure for eugenic solutions might therefore logically be expected to come from the most needy and their advocates.

Typical Simulation Results

This section provides some "what if" type figures for several hypothetical eugenics programs. The calculations are based upon the assumption that presently existing conditions hold for the periods shown, out to 300 years; this will clearly not be correct. The heritability is an important variable for which there is little consensus as to value, here taken as 0.5. However its influence can be easily understood since heritability and time are inversely related. *E.g.*, if the heritability were increased by 50%, the time for the charts would compress by a factor of two thirds. A commonly quoted range for the reported values of heritability is 0.40 to 0.70. As one assumes lower or greater values of heritability within the above range, the 300 year point of the time axis may effectively increase by 25%

GROUP CHARACTERISTIC	GROUP 1	GROUP 2	GROUP 3	GROUP 4
STARTING GROUP IQ AVERAGE	-18.00	-8.00	0.00	10.00
STANDARD DEVIATION OF GROUP IQ	12.00	13.00	15.00	12.00
IQ/BIRTH-RATE SLOPE, SD=1	-0.150	-0.100	-0.100	-0.050
FRACTIONAL PARTICIPATION	0.80	0.80	0.80	0.80
GROUP FRACTION OF TOTAL POP.	0.110	0.070	0.770	0.050
AVERAGE GENERATION LENGTH	24	25	27	27
FRACTION OF GROUP WHO ARE DONORS	0.1	0.1	0.1	0.1
AVERAGE NUMBER OF CHILDREN	2.085	2.000	1.680	2.000

HERITABILITY = 0.50; MAXIMUM PARTICIPATION LEVEL OF GROUP = 0.5.

Table 1. Standard conditions for Figures 10 through 25.

or decrease by 29% from that nominal value.

The figures are plotted four to a page, with some intentional redundancy to enable an easy comparison of trends in going from no program to quite obtrusive eugenics programs under different assumptions. All curves are plots of group mean IQ as a function of time for various participation levels or programs. Participation level is here defined as the fraction of parents in the total population that participate in the eugenic program, exclusive of donors. This is the product of the eligibility, those falling below the IQ threshold which qualifies for participation, by a constant (0.8) representing the fraction that do so participate.

The first set of four might be called the nominal set, representative of most nearly "typical" conditions. In these curves the level of the program starts at zero, and builds over a three hundred year period to a maximum value, which value increases from figure to figure. The second set shows the same thing as the first, but assumes an instantaneous program start. This is highly unlikely to occur and both reckless and precipitous if it does. It is not proposed but does illustrate some limits. The third set is similar to the second. However, a different method of allocating the program participation among groups is used. The method forces equality among groups after steady state conditions have been reached. The fourth set takes two levels of eugenics participation and makes lowest and highest reasonable assumptions on heritability and donor cutoff levels to estimate error bounds on the results.

Table 1 lists the program input parameters that form the basis for the calculations. For each figure, the baseline values will apply unless otherwise specifically noted. Although these have been selected to be representative, certainly there is considerable disagreement on them. The total impact of the results, however, is not dependent upon the exact figures used. A non-controversial set would be preferable to have, but is not presently available. Those that disagree with the figures used may substitute their own. The unavailability of dependable and acceptable data suggests an urgent requirement to fund some research in this area. IQ values are from an assumed

global mean of 100.

In the first set of figures, 10 through 13, the data show a highly negative trend. This trend is due the assumed relationship between IQ and the average number of children per woman, with a small effect due to differences in the ages at which the children are born. The first level of eugenics participation, Figure 11, is chosen to represent a level that just maintains the status-quo, at least in so far as the average is concerned. The other two levels are close to two and four times that level. A side effect, even of the minimal program, is that the disparity between groups diminishes with time. It is clear from the figures that an effective eugenics program will not be trivially obtrusive. That is an unpleasant fact to face. If a eugenics program is to make sense, we must realize that a significant price must be paid for a significant benefit to posterity. While digging our way out of the present morass is very discouraging, the long-term future need not be so grim. A feature that makes the present situation difficult is that group differences are terribly invidious, and will remain a bone-in-the-throat until they are resolved. A significant positive program would be required to bring that about. Once that is accomplished, however, the IQ/birth-rate issue might fade into insignificance. Without this driving force, the necessity for a eugenic program to "stay even" disappears. As the competition between groups diminishes and the population as a whole participates more fully, perhaps we can move in the "melting pot" direction again.

The next set of curves, Figures 14 through 17, is provided for completeness. It puts bounds on the advantages of starting a eugenics program abruptly. A comparison of these figures with the first set shows that the rate of progress is roughly proportional to the investment, such that for a given goal the total integrated obtrusiveness is nearly constant.

The next set of curves, Figures 18 through 21, illustrates an algorithm for making certain that all groups converge in time to a common mean IQ. The approach in the first two sets is based upon a threshold in participation which is common to all people, irrespective of their group membership, except that

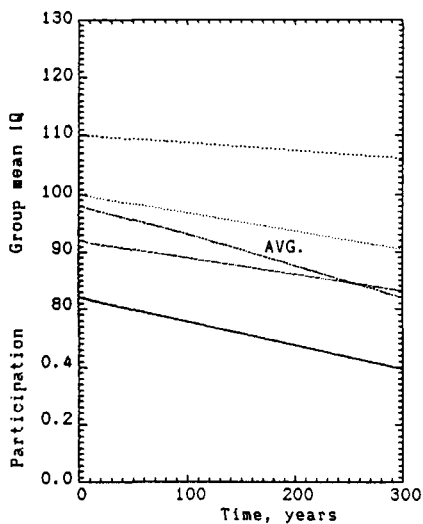


Figure 10. Group mean IQ versus time with standard conditions and no eugenics.

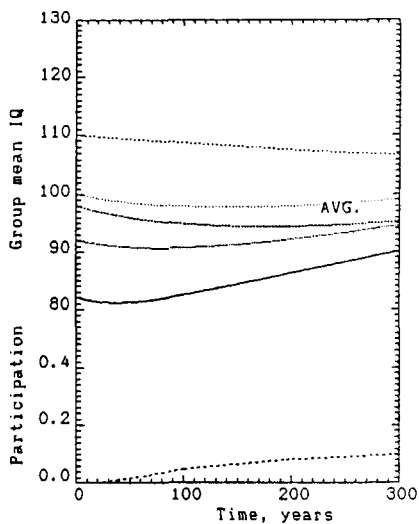


Figure 11. Group mean IQ versus time with standard conditions and 0.10 participation.

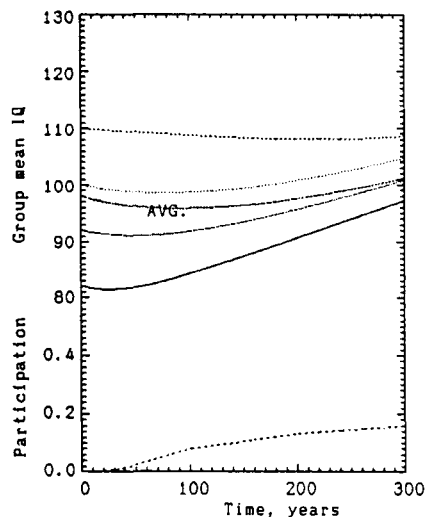


Figure 12. Group mean IQ versus time with standard conditions and 0.16 participation.

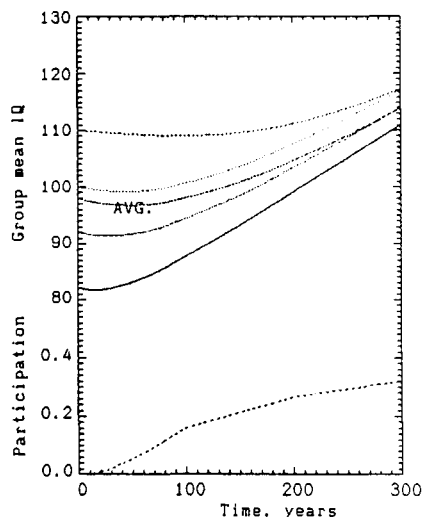


Figure 13. Group mean IQ versus time with standard conditions and 0.32 participation.

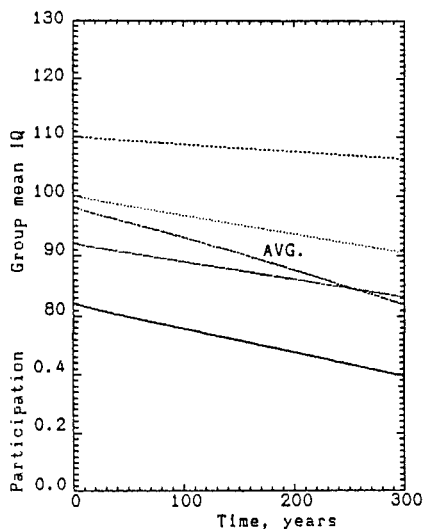


Figure 14. Group mean IQ versus time with standard conditions and no eugenics.

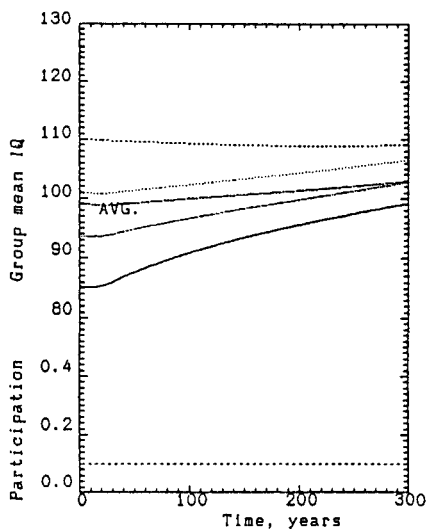


Figure 15. Group mean IQ versus time with standard conditions and constant 0.10 participation.

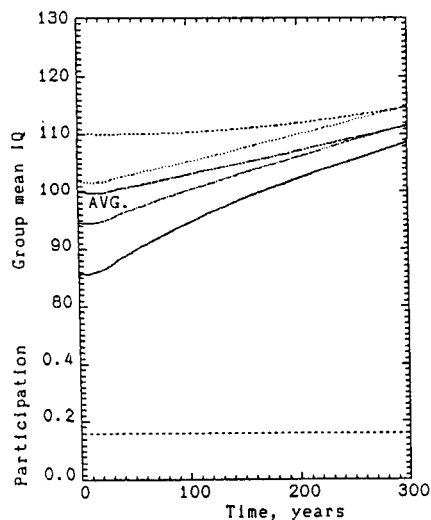


Figure 16. Group mean IQ versus time with standard conditions and constant 0.16 participation.

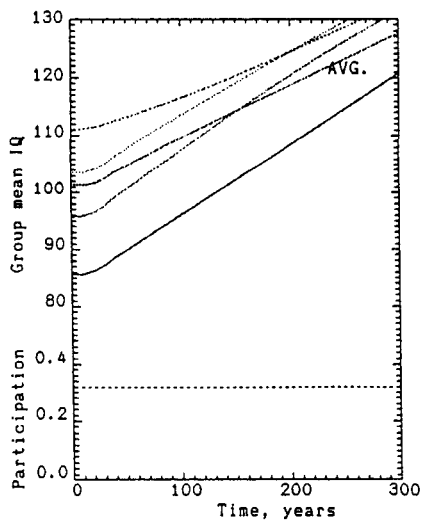


Figure 17. Group mean IQ versus time with standard conditions and constant 0.32 participation.

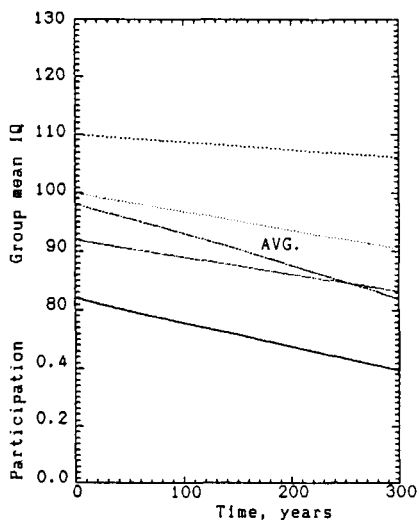


Figure 18. Group mean IQ versus time with standard conditions and no eugenics.

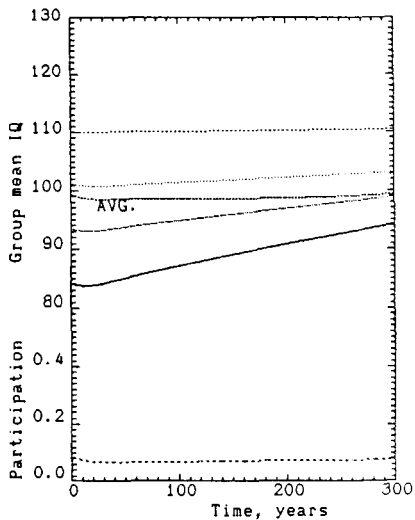


Figure 19. Group mean IQ vs. time with standard conditions and special algorithm with participation as shown.

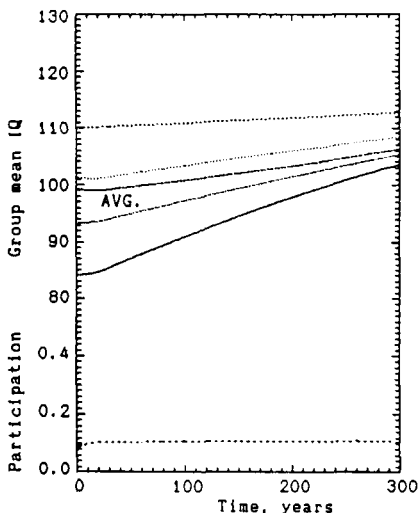


Figure 20. Group mean IQ vs. time with standard conditions and special algorithm with participation as shown.

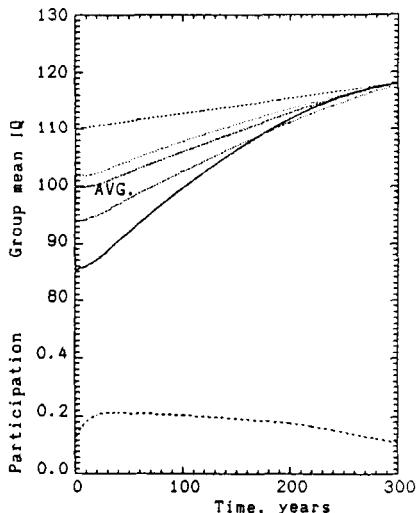


Figure 21. Group mean IQ vs. time with standard conditions and special algorithm with participation as shown.

Condition	Participation Level	Heritability	Donor Fraction	Figure Number
Worst case	0.20	0.40	0.10	22
Worst case	0.40	0.40	0.10	24
Nominal	0.20	0.50	0.10	16
Nominal	0.40	0.50	0.10	17
Best case	0.20	0.70	0.01	23
Best case	0.40	0.70	0.01	25

Table 2. Special conditions selected for Figures 22 through 25 to illustrate the sensitivity of the results to these values.

a limit is placed upon the maximum level of participation of any group. The algorithm used in Figures 18 through 21 is designed to bring the mean values of average IQ for all groups together. Using this alternative method does not significantly change the program until the groups converge to something less than a standard deviation in IQ. At that point, there are artifacts in the standard model that make the means differ depending upon the assumed group IQ standard deviation. This last approach eliminates that small residual. The practical difference is not great, but the philosophical approach is significantly different. The ethical considerations and merits of this approach are not addressed here. That decision would be made at a time when the program was considerably better understood. Apart from illustrating the possibilities, it is not of concern at this time.

The last set of curves, Figures 22 through 25, is provided to show the effect of some of the more controversial parameters on the results. For two participation levels, corresponding to Figures 12 and 13, the calculations were repeated using minimum and maximum levels of heritability and the donor-selection threshold. See Table 2 for the non-standard conditions for each run. While quantitatively the changes are far from insignificant, at either level the problem is addressed. In that sense this is not a significant factor influencing the general conclusion relative to the need for more attention to this problem. A significant factor that also reduces the impact of the heritability factor is that this factor is a two-edged sword. A very low value of heritability reduces the rate of decline due to the IQ/birth-rate slope to a very low value, apparently reducing the seriousness of that problem. However, at the same time, the low value of heritability makes it much more difficult to use eugenic methods to recover any lost ground or to stop the decline. Thus the eugenic effort expended to stay even is independent of the heritability. If the goal is to reduce the difference between groups, then a high value of heritability makes that transition easier.

While one may debate the value of heritability, the debate will not change that value. It is of interest to note in passing,

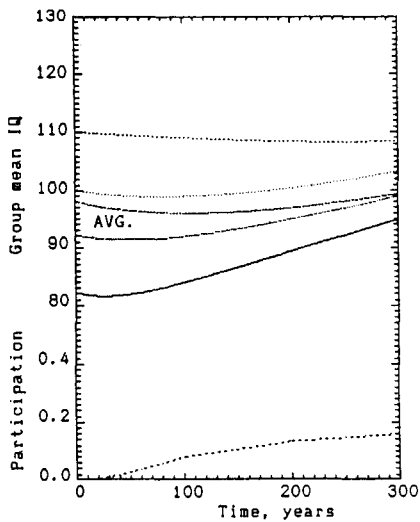


Figure 22. Group mean IQ vs. time for worst case conditions and with participation of 0.16.

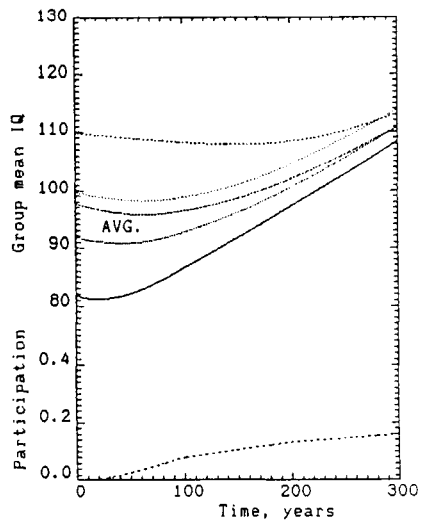


Figure 23. Group mean IQ vs. time for best case conditions and with participation of 0.16.

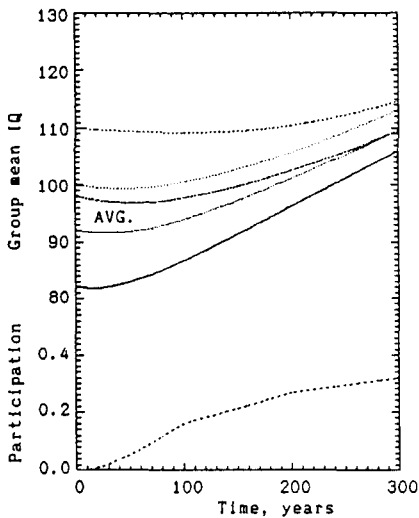


Figure 24. Group mean IQ vs. time for worst case conditions and with participation of 0.32.

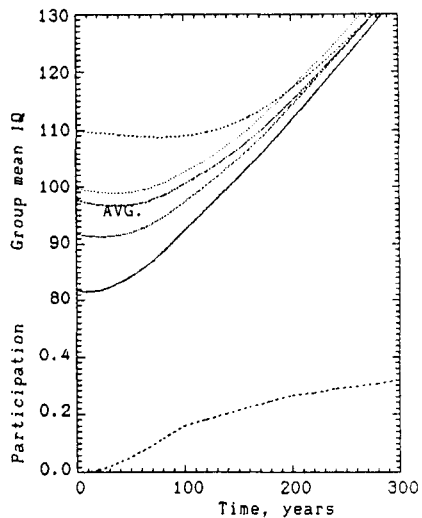


Figure 25. Group mean IQ vs. time for best case conditions and with participation of 0.32.

however, that those that would deny the need for eugenic methods cite very low values of heritability as one of the arguments against. In fact, such a low value would not affect the level of effort needed to counter the IQ-birth-rate slope, but would increase the level of eugenic efforts needed to rectify present inequalities.

Experiment Design

The eugenics experiment described in this section is the first major step recommended in this work. While one might be convinced of the value of a "for real" program, to be realistic it would be premature to start without a small-scale test phase. It is premature because the stakes are very high and any mistakes may confuse the issues such as to abort the program prematurely. This does not preclude open-minded debate and steps short of a eugenics experiment that could be useful in bringing consensus.

The general approach to the experimental design is minimalist: no more than needed to obtain information that is valid and useful. It need not be so exhaustive as to preclude ambiguous results, as, in almost any experiment, there are zones that point to the need for further clarification. The experiment should at least measure what it started out to measure. If that value lies midway between two clear results, at least the problem is better defined for the next experiment.

The program should seek to evaluate information in two areas. One of these is the change in the average IQ of the eugenic children referenced to the IQ of the control group. Equally important would be a number of less well-defined but very important factors such as:

- a) The ability of the family to adapt to the stress of the program,
- b) Psychological problems experienced by the children, and
- c) General tolerance of the community to the program and results.

While it would perhaps be tempting, in this first experiment, to compare the effectiveness of a number of eugenic approaches, this would increase the size of the program. This,

of course, would make it more obtrusive. It is suggested that a single model be selected as a leading candidate for this effort. In this case one can estimate the precision needed as a function of numbers of children and families. The dominant contributor to this statistical error is the normal dispersion in IQ which is on the order of 0.866 standard deviations for a heritability of 0.5. The standard deviation contributed by test error is on the order of 5 IQ points. These add to a root-sum-square of approximately 14 IQ points.

If one planned an experiment with 300 families with two children per family, the statistical error would be about 0.7 IQ points. Combining this with a similar figure for a control group would give an accuracy of close to one IQ point. Since, if theory is correct, a 10 point IQ difference is on the order of that expected by those that accept the general tenets of this work, the sample size is large enough to test that hypothesis. A result, however, of 3-6 points improvement would confound both those expecting greater gains and those claiming no gains at all, and would send one back to the drawing board. However, if so, that is what one did the experiment for in the first place.

Because the need for precision is subjective, one could easily pick a participation level from 300 to 1000 families by the same arguments. In a well designed program the control group would be significantly larger than the eugenic group, since the members of the control group contribute much less to the obtrusiveness of the program. Although the group size must be large enough to assure a definition of the basic problem, there are always more highly structured trends and facets which are or may be observed at the same time. These factors have a lesser statistical significance, and the larger the group the more one can learn from the experiment.

Ideally, the experiment should be "blind" so that participants do not know whether their child is eugenic or their very own. The ideal from the standpoint of experiment design might have to be passed on this experiment. At least, however, membership in the control group and eugenic group should be determined by chance, to keep the experiment as unbiased

as possible.

Both groups should receive extensive counseling and psychological testing so as to explore and define significant variables in addition to IQ. Insofar as possible the evaluations should be designed to provide trend data, providing a basis for correlation with results of subsequent testing. If the program progresses at all beyond this first phase, further and more elaborate testing and controls will be required as a permanent feature of the program. The obtrusiveness of this testing, however, should decrease due to the lower sampling rate feasible in a large program.

Given the relatively small number of participants in the program and assuming geographical dispersion over the country, confidentiality could be obtained if the parents were cooperative and willing. All statistics could be provided only on a global basis so that, at least outside their families, children would not be subjected to either positive or negative prejudice.

Another approach which lacks some of the rigor of an explicit test design would be to piggy-back on the some 10,000 artificial inseminations which are said to occur in the US per year. These are mostly families in which the husband is sterile, and the would-be parents none-the-less wish children. Since these couples have already accepted this approach to meeting their needs, they are a biased sample from the standpoint of psychological impacts. One could, however, establish methods for estimating the children's IQ in these instances, together with some estimate of the accuracy of that measure. In view of the inability to use a control group, such a program should be used only to supplement the experimental program or to provide some initial data before proceeding.

Risk Assessment

Since all projections into the future are uncertain and in the end subjective, some rationale for making intelligent decisions is essential. There are two general strategies: 1) – to seek for the best average outcome and 2) – to minimize the maximum risk. The former plan, for instance, would not recommend fire insurance, as administrative costs will always mean that, on an

expected-value basis, fire insurance is never prudent. That is not to say that it is not prudent, but that fire insurance is more nearly consistent with an attempt to set a floor to a worst-case situation. Actually, of course, one generally does some of both. In the present instance, they both give equivalent results.

Those that disagree with the preceding general developments will see our choice conditioned by maximizing the present benefit, and have little concern for risks for our progeny that appear to them to be unlikely at best. There may be others, even those who for one reason or another do not concur with the general pessimistic thrust, who are willing to consider what general steps one might take to cover against the possibility that they are incorrect. A question is, what level of uncertainty in the truth of this paper corresponds to the break-even point between action and inaction, between concern and no concern?

In approaching that question, the first problem is to find some measure of "cost" to quantify the risks. A clear answer is that the effects transcend economics pitting various ethical principles against each other, such that even were ethics the only dimension, the problem would still be far from straightforward. In the present instance, however, the initial steps proposed are so minuscule as compared to the total impact that an accurate balancing of competitive interests is unnecessary to reach some general conclusions.

The issues will be analyzed as if there were only two dichotomous realities, that the general tenets of the paper are correct or that they are incorrect. This is justified by the fact that most people seem to believe in one of these choices or the other, and also because intermediate results are readily approximated from this tractable problem.

Instead of trying to find a consistent measure of value for the differing types of costs and/or benefits, values associated with the two views of reality will be provided for each type of cost, and a general assessment may be made on a judgmental basis. The three types of cost or values considered are:

a) Number of persons directly impacted by or participating in a eugenics type program.

Probability		Tenets of work correct P				Tenets of work incorrect (1-P)			
Action		Economics persons impacted	Eugenics persons impacted	IQ		Economics persons impacted	Eugenics persons impacted	IQ	
N O T E S T	Eugenics level								
	0.0 percent	360,000,000	0		85	0	0		100
	10.0 percent	0	32,000,000		100	0	0		100
	16.0 percent	?	51,200,000		115	0	0		100
	32.0 percent	?	102,400,000		125	0	0		100
T E S T	Eugenics level								
	0.0 percent	360,000,000	0		85	0	1,200		100
	10.0 percent	0	32,000,000		100	0	1,200		100
	16.0 percent	?	51,200,000		115	0	1,200		100
	32.0 percent	?	102,400,000		125	0	1,200		100

Table 3. Risk assessment tabulation.

b) Number of persons seriously impacted by a severe drop in the standard of living, racial strife, and poverty and hunger, much as obtains in South Africa today.

c) Average IQ of the population, suggestive of the ability to manage in a world that is becoming increasingly complex and competitive.

The two top lines in Table 3 identify the two dichotomous views of reality, with which are associated probabilities of being true, P , and false, $(1-P)$. Below are column headings for costs associated with each option.

The action item is whether to perform the test. Performing this test is the major recommendation. What performing this test buys is to give some guidance as to which level of eugenics, including none, should be applied to the problem. In other words, it provides a better estimate of the value of P than is now available. Subsequent decisions should be made in the light of the results of that test. It should give one a first estimate of which column is correct and germane, or perhaps an interpolation between the two. The test cost would be the obtrusiveness of the test which would affect some 1200 people, 300 couples with two children each. This cost would apply whether the assumptions of the paper were correct or not. If the assumptions are correct and, despite the results of the test, one elected to do nothing, the only change would be that the obtrusiveness of the test was added to the those impacted eugenically on "tenets are true" side of the equation. This amount is insignificant as compared to those economically disadvantaged, and will be neglected.

On the other hand, if the results of the test indicate that there is a significant probability that the tenets of this paper are correct, then there will be serious impacts in the economic and IQ cost figures if nothing is done. Assuming that some 30 million people per generation are seriously impacted by the precipitous fall in living standards as our work force becomes significantly less well matched to the needs of the work place for a period of 12 generations or 300 years, then 360,000,000 people would be economically impacted. Since the generations overlap in time, this would correspond to approximately

100,000,000 at any one time. The average IQ would drop to about 85 on the basis of present IQ standards.

There are, however, several arguments that can be advanced against performing the test. One of these is that there is already sufficient evidence that there is no problem and therefore no more data is required. A problem with this is that regardless of the truth of the assertion, there is certainly insufficient evidence to convince disbelievers. There is little if any evidence to start with, and what little there may be is not as convincing as experimental test results.

A second argument is that eugenics is so obtrusive and unethical that even if the tenets of this work are correct we are better off to let "nature take its course." If things get too bad, then "evolution" will stop the decline. It is difficult to fault this argument on a logical basis, since it is not based upon logic but rather an authoritative assertion of values.

A third argument is that we do not need eugenics to stop the decline. We need only to stop the negative birth-rate/IQ relationship by encouraging professional women to have more children by providing child care services and similar social changes. The problem with this suggestion is not that it would not work, but that it is a *eugenics* program. That is precisely what eugenics is all about. One is not debating eugenics or no eugenics, but formats to be employed and their effectiveness.

The only group that has a strong stake in not performing the test are those that fear the test will demonstrate that we do have a problem after all and who are most unwilling to face the ethical consequences of that fact if true. For them, ignorance is an excuse for inaction, which is believed, probably rightly, to be in their personal interest. There is no logical counter to this argument, as is it is perhaps valid for that ethical mindset.

Given that there is now a serious amount of structural unemployment and that the poor are becoming increasingly polarized and angry at inattention to that problem, the assessment that some 100,000,000 at any one time would be seriously impacted is not unreasonable. When economic deprivation becomes severe, it is hard to rationalize the

acceptance of that as less ethical than participation in a eugenics program. Starving or malnourished children and racial strife are very unpleasant, not only for those directly impacted, but also for society at large. Nevertheless, it is impossible to quantify the ethicalness of the several effects. What this proposed test would buy is the first really good assessment of the costs and realities of eugenics the world has ever seen. There are problems that can only be addressed experimentally, as opposed to scientific guesses and extrapolation. While the results might not be as clear as one would wish, with the experience obtained one could design a better test or abandon the idea as impracticable. An example of the kind of thing that is hard to evaluate without experience are the emotional reactions of the participants.

If the test results clearly indicate that it does not work, or that it works but we are unwilling to pursue the project because it is too divisive, the "game is over" and there need be no more tests. One stops with the test results. On the assumption that one finds that the eugenics is practicable, then one has the following options:

DO NOTHING:

In this case, the only difference from not having done the test is the additional test "expense." Clearly, by any standard, the test cost is dwarfed by the other impacts, and all of the "do nothing" considerations apply.

BREAK EVEN:

A second option would be to embark upon a level of eugenics which would at least "break even." A difficult fact to face is that such a program would be far from trivial in its impact, and would involve some 10 percent of the population. This is not a pleasant alternative. In contrast to the "do nothing" alternative, however, it represents an improvement.

MOVE AHEAD:

The next two levels correspond to gaining 15 IQ points at 16 percent participation and gaining 25 points at 32 percent

participation. Assuming for the moment that all we need or care to do is stay even, no credit is given for the increase in IQ in the economic column, as that is hard to define. However, to state that a gain from where we stand now has no value would be difficult to defend against those at the bottom of our economic ladder.

One also needs to be aware of the fact that these options bear very unevenly on the affected persons. If the tenets of this work are true and we do nothing, those on the poor side of the scale would suffer directly and seriously. Those not so unlucky might be able to live in walled cities, ghettos, or use brutal repression to provide a measure of security. If the lucky had a very tough skin, they might not suffer too greatly.

What one would buy from the experiment is to give the next generation something upon which to base a choice among the many poor alternatives. The cost of the experiment, by any measure, is swamped by the value of the results for decision making. Further decisions, other than attempting to get some meaningful data, are meaningless at this point. Surely succeeding generations will give little heed to our plans, although they would certainly take advantage of any valid and believable data that we could provide.

Then comes the ultimate question, what is the value of P , the probability that the tenets of this work are correct, that would be associated with a break-even figure of 50/50? If one neglects the obtrusiveness of the eugenics programs, one might estimate one in 300,000. If one assumed that the obtrusiveness of the eugenics program counterbalanced 90 percent of the associated economic benefits, then the value would be one in 30,000. Even if one believed that the obtrusiveness of the eugenics program exceeded the economic gains, one could still concur that the expense of the experiment is justified to support a more rational decision making process. In fact, denying those that wish information upon which to make a decision is ethically similar to destroying evidence in a court of law.

Given the extreme difficulty of making judgments with any high degree of certainty in social problems with the heavy

emotional impact that this one has, any assessment based upon theory, either for or against, is suspect. We need believable data desperately. The burden of proof is therefore upon those who believe that they can demonstrate that all the answers are in with close to mathematical certainty.

Summary

This work has addressed the ethical issues surrounding the nature/nurture controversy and finds that controversy not to be germane to the basic existential problem. The question is not nature versus nurture, but do we have the courage to seek an answer rather than deny the problem as too painful to consider. The theses are that:

- 1) the stakes are too high not to accept the pain that goes with dialogue.
- 2) the pain is much over estimated in any case, and
- 3) we have some ethical obligation to our progeny not to squander our genetic heritage nor pass on to our children any divisive differences undiminished.

The social pressure at conformity to the "know nothing" stance is not so great as it was in Germany under National Socialism, but its effect comes close. Foreclosing on the debate and discussion of a "vision of reality" central to the burning issues of the day is dangerous even if well-intentioned. The problems are exacerbated since the abstract and scientific part of the debate rages on. Concentrating on the technical side while leaving a vacuum in the ethical domain leaves too many questions not only unanswered but also unaddressed.

Admittedly there are no "Pollyanna" solutions if the problems discussed are even partly true. And also admittedly solutions may require the rethinking of some of our most cherished beliefs. But if we do not have the will or courage, as least we should recognize and accept that fact.

APPENDIX A

Summary of Evidence for Existence of Group Differences

This summary of data in favor of the existence of group differences in IQ cannot provide an exhaustive treatment due to the limited scope of this work. Given the nature of the subject and the emotional bias brought to the issues, however, there is even a question as to whether one should even attempt it. To do so is to make it appear that what is important is to derogate specific groups. The point of view taken, rather, is that IQ is very fragile and therefore that *all* groups must be aware that social policy influences genetic health. "Group" is intended in both an exclusive sense and an inclusive one. As long as we accept a general Judeo-Christian concept of ethics and morality, we are all in the same life boat. Our interests are inclusive of the interests of all subgroups.

All groups owe their present intellectual competence to the sacrifices, albeit unwilling, of their ancestors in the process of evolution. What we have obtained at great cost we should not squander, but at very least pass undiminished to our children. If, looking at where we now stand, we find that either God or nature has left us in some respects disadvantaged, we should decide to leave our children better off in that regard.

Evidence that group average IQ values do differ should imply either a desire to bring them together or a willingness to gracefully accept the differences. The emotion and stress displayed when the subject is broached suggests that the latter course, graceful acceptance, is not likely to occur. Suggestions as to the desirability of reducing such differences is frightening to some; thus even discussion of that possibility is socially proscribed. Hence the insistence upon the view of intelligence as a permanent, uniform, unchangeable characteristic of human groups.

One very straightforward argument for the existence of group differences in IQ is that evolution has been proceeding for some 10 to 100 thousand years in a number of relatively isolated groups. For evolution to proceed at the same rate in all such groups would be exceedingly unlikely unless there

were a compelling reason. The argument is judgmental. It is not the kind of evidence generally acceptable in science, as it is clearly impossible to test. One rebuttal, Brace(1980), suggests that the fact that all of these societies were hunter-gatherers is reason enough to assure consistent development. The reader will have to judge for himself whether in his view this would be sufficiently controlling.

Also in evidence is that standard tests of IQ used in the US do reflect group differences for native-born, English- speaking groups both above and below the majority. The question is whether this an artifact of the tests or reflects reality. A lay person could scarcely afford to become acquainted with a significant part of the literature. A British journal, *Behavior and Brain Sciences*, however, reviews important works in its field, publishing a precis of the work by the author, peer comment, and author reply, all complete with references to the literature. One of these reviews, Arthur R. Jensen (1980), covered his book, *Bias in Mental Testing*.

This review provides, in one reference, a convenient way to obtain the sense of the arguments with references to the literature on the points of disagreement. This book does not purport to directly address the question of the cause of any group differences found, but rather whether existing cognitive ability tests are biased against some groups. Since these tests are generally accepted as showing differences in group average scores, irrespective of the intent or thrust of the book, it does bear upon the issue at hand.

The peer review, however, never provides evidence to prove that all groups are equally capable, but rather that the arguments that they are different either are or may be flawed. A finding for differences is believed by many to be prejudicial to some groups. Unless one can scientifically prove such differences, therefore, one should find for the more equalitarian position. Where it not for the fact that denying the problem forecloses any serious effort to find solutions, there might be more merit in that position. One might ask the question: "How much worse do things have to get before one can justify looking at all aspects of the problem, instead of a

narrow subset?"

A summary of the results found in the book are quoted from the *Precis*:

"Good tests of abilities surely do not measure human worth in any absolute sense. But they do provide indices which are correlated with certain types of performance generally deemed important for achieving responsible and productive roles in our present day society.

Most current standardized tests of mental ability yield unbiased measures for all American-born, English-speaking segments of American society today, regardless of sex or racial or social class background....."

Unfortunately, the issues are too complex to cover. Since the major thrust is that there is a problem and it should be addressed, it will be presumed that this is evident from the potential consequences and the fact that some two thirds of the twenty-seven peer reviewers did not take issue with this basic conclusion of the book. For those that might wish to expose themselves to some of the give and take involved in this debate, the book and the critique with comments provide a minimal start. They also provide a bibliography which contains many seminal articles that provide a basis for further exploration using citation indexes if desired.

One of the issues addressed that bears on the question and is less complex than the statistical techniques involved in the test validity analyses is the correlation between the "g" component of intelligence (See note bottom of page 289) and certain physiological variables that would seem not to be culture related. For review articles see Eysenck (1985), Hair (1983). One of these is the amplitude of specific brain waves when the subject receives either visible or auditory stimuli. It is found that these correlate in the range of 0.6 to 0.7 with "g" when adjusted to eliminate the effects of preselection of subject abilities. Other experiments consist in measuring the response time of the subject to stimuli when various mental operations of graded complexity are required for response. In a typical case, the subject views a number for two (2) seconds. He is then given a single digit, and is to indicate whether the

number was or was not contained in the number he had just seen. It is found that the response time is correlated with intelligence measures, and that the correlation increases as the amount of processing required for the particular test design. The processing, however, is sufficiently elementary that the subjects make no mistakes if given enough time. Thus the task is simple enough to be mastered by all subjects.*

A fourth reason for concern is that the difference between black and white performance on IQ tests over a period of 60 years shows no significant change in the mean difference, Gordon (1980). Admittedly test sophistication has greatly increased over the years and many of the early tests were flawed. However the period has seen very significant increases in the comparability of school attendance and a narrowing of the black/white differential in earned income, as well as a more significant participation in the work force. Because the tests are not necessarily compatible as to scale, the difference is normalized to the standard deviation.

In summary, the arguments for the existence of group differences in intelligence are:

- 1) The separate development of isolated groups,
- 2) Test results obtained using IQ and similar tests,
- 3) The existence of physical and physiological correlates of IQ, such as brain waves and reaction time.
- 4) The stubborn history of the measured relative difference found in standard tests over a 60 year period during which environmental factors have markedly changed.

* The "g" component of intelligence is a statistical construct which represents a common denominator in many types of intelligence tests. Those endorsing the use of this construct would use "g" as a base, and express the results of other tests as the sum of "g" and uncorrelated test-specific vectors. Others take issue with this construct, preferring to use separate single variables for each type of test with mutual correlations between them. Mathematically these are equivalent, but seem to many to have ethical and philosophical connotations. E.g., the common use of "g" leads to a single-dimensional rank-ordering measure, as opposed to diffuse multi-dimensional ones, the use of which provides less opportunity for "labeling."

Those preferring the use of the "g" construct believe that it clarifies the issues and forces one to come to grips with the basic problem. They see denial of the reality of "g" as a mode of problem avoidance rather than resolution. Since reality is reflected in either framework, this dispute is not germane to the arguments of this work.

APPENDIX B

Evidence for a Negative IQ/Birth-Rate Slope

In this appendix three sources of data with respect to the effects of a negative correlation between group IQ and the group birth-rate patterns will be covered. These include more details on the study by Vining, Vining (1983), a classical study by Higgins, Reed, and Reed, Higgins (1982), and a less formal analysis using some data from Jensen's *Straight Talk About Mental Testing*, Jensen (1981). Each of these sources in one way or another is not entirely satisfactory. The last mentioned suffers from the fact that IQ values were not available, and the estimation therefore is not at all direct. All of which supports the need for a well-funded continuing study to track this dynamic problem.

Vining:

Vining (1983) argues that one cause of the decline of all previous civilizations may be the degradation in the competence of nations due to a relaxation in genetic selection that takes place under civilized conditions. This is manifested in a negative IQ birth-rate or reproductive relationship. In the summary at the end, he cites sources that believe that the cultural decline proceeds at a greater rate than the genetic, and therefore the decline in capability might not be the primary causal factor. This is not to suggest, however, that if cultural effects could be eliminated genetic effects might not have a similar result.

As part of the analysis he presents data from the 1980 census on children born to persons aged 25 to 34 in 1978. The sample sizes range from 456 to 2066. This data is not complete, as births after age 34 are not included. In an attempt to

get a better estimate of the totals, self report estimates of expected births are also provided. The data is consistent with an estimate of a decline in IQ of about 1 IQ point per generation.

Higgins, Reed, and Reed

J. V. Higgins, E. W. Reed, and S. C. Reed, Higgins (1962), published a study which explains some previously found inconsistencies between the known positive correlation between family size and IQ and the absence of evidence for the postulated decline by the inclusion, in effect, of "families" with no children. When these are included in the study, no decline was found. While this study points out procedural errors in some previous studies, the sample predates current trends and the sample is not broadly representative.

Based on Scholastic Attainment vs Numbers of Children

Jensen (1980), provides data from the 1970 U.S. Census giving the average number of children per woman ever born to all women 15 to 44 years of age as a function of scholastic attainment. The data is only provided as being suggestive of trends rather than as useful for the purposes of scientific estimation. As there are very few studies providing estimates for this IQ/birth-rate relationship, an estimate from this data was made. The *1980 U.S. Statistical Abstract*, page 149, provided estimates of the numbers of women falling within each scholastic attainment category.

The only at all reasonable way to get an estimate from this data is to assume that any effects found are degraded by the correlation coefficient between scholastic attainment and IQ, on the order of 0.5. Using this approach the downward drift per generation is estimated to be some 20 percent less than that found by Vining (1983). Given that extrapolation by multiplying by the correlation coefficient is a guess at best, the data are not inconsistent.

Summary

The most remarkable fact about the data is that such a

crucial factor in the genetic health of this country is so poorly defined, and that is not to fault the efforts made in this direction to date.

The best approach is to estimate the number of children born each year at any age, together with the IQs of the parents. This provides a complex projection problem if one intends to merge data from many age cohorts to estimate future births and trends optimally. The effort, however, is small compared to the cost of gathering the data, which needs to be consistently and regularly collected. Such an effort requires funding beyond the resources of most academic institutions and also requires the cooperation of the Bureau of Census to perform expeditiously. These requirements are not difficult to manage. The problem is to overcome the objections of those that apparently believe that it better to remain uncertain than discover reality.

APPENDIX C

Model Development

The development of the model is in two parts. First is a description of the model assumptions. Then follows a derivation of the basic equation for the change of the average new generation group IQ from that of the parents. This includes the combined dysgenic effects of an IQ/birth-rate slope and the eugenic effects of the postulated eugenic program. It is assumed that there is no mixing between groups. The eligibility levels are set so as to either emphasize aid to the less-well endowed or to make the group average IQ values converge.

Description

The model includes three parameters that are easily confused. It is essential for clarity to define these and refer to them by consistent names. The first category relates to the fraction of the total group population that qualifies and is eligible to participate in the program. This group is determined on the basis of an IQ threshold, the theory being that those most in need should have priority access. This group

could be defined either on the basis of threshold IQ or the fraction of persons of that group with IQs below that level. The latter measure is chosen as it relates more closely to one of the important considerations of the study, and that is obtrusiveness. This measure of participation will be called "eligibility". The fraction of those eligible that actually participate will be called the "fractional participation." A nominal value of 0.8 is used throughout. This was done because changes in eligibility and fractional participation have similar effects. The third measure of concern is the actual participation level: the product of the eligibility and the fractional participation. While this measure is the most meaningful, it is a derived parameter, not an input parameter. Where used, the name "participation level" will be applied to this measure. Since the "eligibility" was used for the variable parameter, it overestimates the participation level by 25% for the nominal runs.

The future is unpredictable and even current group characteristics hard to define. When defined they are controversial. The calculations therefore are designed to be "what if" in nature. These are suggestive of best and worst case assumptions for the purpose of comparing options. In no case are the results presented as scientifically valid in an absolute sense, although the trends and general results can be a substantial aid in comprehension.

Basic Assumptions

Precis of Assumed Eugenic Program: It is assumed that genetic donations from male donors selected to be above some cutoff point in IQ are provided for participants in the program selected on the basis of having an IQ lower than a second threshold. The discussion justifying this selection is not included in this technical annex. It gives similar results, however, as systems in which births are restricted among those with lower IQs and where there are donations of ova from selected female donors.

Parametric Definition of Groups: In order to make a model, the group characteristics must be quantified, even if the input data are not accurately known. The characteristics included in this

model are:

- a) Group average IQ.
- b) Standard deviation of group IQ distribution.
- c) Group average intergenerational period.
- d) Number of children per "family."
- e) Slope of the IQ/birth-rate curve, assumed linear.
- f) IQ threshold below which participants are chosen.
- g) IQ threshold above which donors are chosen.
- h) Initial fraction of total population represented by the group.
- i) Fraction of eligible families participating. (Participation is voluntary.)

Applicability of IQ/Birth-rate slope to participants: It is assumed that for eugenic participants in the program, replacement is at the average replacement rate, not including the slope.

Heritability Assumptions: A heritability of 0.5 is assumed as a baseline value, although estimates range from 0.4 to 0.7. This value effects the rate at which things happen, but does not generally change the nature of the process. This parameter is not built-in, but may be changed at run time.

Distribution of IQ: It is assumed, contrary to fact, that the distribution of IQ is Gaussian, even in the presence of the assumed eugenic programs. While this is an approximation, accounting for the actual distributions explicitly increases the run time by several orders of magnitude. It is thus also incompatible with the desire for a program that one could use to explore options expeditiously. A previous program did include such factors, and for the runs compared, gave comparable results.

Eligibility: The assumed eligibility is defined in the program by an up-to eight point linear fit over a 300 year period, with table definition open at run time. Default tables, however, are provided as the input process would otherwise be very tedious.

Eligibility rules: Two participation plans are provided. One is based upon "individual" rights, while the other is designed explicitly with the goal of reducing differences between groups. Actually, both plans are much alike on the basis of results.

A: Individually Based:

Participants are selected for participation if they wish if their IQ is lower than some selected threshold, regardless of group. A proviso is made in the model for the introduction of a maximum eligibility level for a group, on the theory that extremely high levels are both impracticable and unreasonable. This is an open parameter.

B: Group Based:

Cutoff levels are set for the group depending upon the group average IQ in comparison with the other groups. The groups are ranked by average IQ, and the participation levels are set for each group such that closure in average group IQ takes place. In the other plan, biases can exist because of differences in the group standard deviation in IQ and IQ/birth-rate slope. Closure becomes slow as the averages converge.

This special case algorithm uses two parameters to determine the relative eligibility of the different groups. One of these is the rank order of the group with respect to average IQ. The other is the maximum absolute difference between the average IQ values of all groups. Eligibility levels are higher for lower rank and greater separation in mean IQ. The equation is:

$$E = C1 + C2 * X$$

where E is the eligibility level, C1 and C2 are constants, and the parameter X is chosen from the following table:

Maximum Group IQ Separation (IQ points)			
Rank	<2	all other	>4
1	0	0	0
2	0.133	0.333	0.533
3	0.267	0.667	1.067
4	0.400	1.000	1.600

The value of C1 used was 0.1, while the value of C2 used was an open variable defined for each figure.

Age distribution of mother for births. The program explicitly

takes this effect into account as an approximation. The major effect is to smooth out the resulting curves so that they do not give the erratic results which assuming that all children are born at the average intergenerational period would give.

Model Derivation

Figure 1 in the section entitled System Design is a diagram describing the population components graphically. The solid curve bounding the top of the figure defines the IQ distribution of the child population taking into account the IQ/birth-rate slope. The original distribution of the parent's IQs is almost the same shape but displaced to the right and centered. The parents distribution is assumed to be Gaussian normal, and can be represented by that relationship:

$$(1) \quad P(X) * dX = \left[\frac{\text{EXP}(-X * X / 2)}{\text{SQRT}(2 * \text{PI})} \right] * dX$$

The curve actually shown is that curve multiplied by a factor so as to include a multiplicative linear term to represent the IQ distribution of the children:

$$(2) \quad G(X) * dX = \left[\frac{(1 + a * X) * \text{EXP}(-X * X / 2)}{\text{SQRT}(2 * \text{PI})} \right] * dX$$

A third functional form that is needed in the analysis is the Gaussian distribution multiplied by X as well as the above term $(1 + a * X)$:

$$(3) \quad Q(X) * dX = \left[\frac{X * (1 + a * X) * \text{EXP}(-X * X / 2)}{\text{SQRT}(2 * \text{PI})} \right] * dX$$

--

The shadings in Figure 1 indicate areas of the curve which

are treated differently in the analysis. Two bounding values of IQ are shown marked XL and XH. XL represents the eligibility level. XH represents the lower cutoff level for male donors to the program. It is assumed that both those eligible and donors are selected randomly from their respective area. The shading marked A represents the eugenic cohort, only a fraction of those eligible. The area B represents those eligible but declining to participate. The area C, indicated as the total population above the eligibility line, is not counted as participants. D represents the donor cohort, not all of whom will contribute. The eugenic children of the donors are included in the eugenic block.

The boundary point, XL, representing the lower cutoff level for donors to the program, is a compromise between being high enough to give a satisfactory base for the program and low enough not to lose effectiveness.

It is convenient first to define some distributions. These distributions are the basic components of the resultant expression. These are the integral of the normalized Gaussian distribution, CUM, the integral of the first moment, PHI, representing the contribution of an area to the average IQ, and the integral of the second power of the normalized IQ with respect to the basic Gaussian distribution, GAM:

$$\begin{aligned}
 (4) \quad \text{CUM}(X) &= \int_{-\text{inf}}^X P(Y) * dY & (5) \quad \text{PHI}(X) &= \int_{-\text{inf}}^X Y * P(Y) * dY \\
 (6) \quad \text{GAM}(X) &= \int_{-\text{inf}}^X Y * Y * P(Y) * dY
 \end{aligned}$$

In the program, these are evaluated either by a rational approximation, analytically, or table look-up and interpolation,

respectively.

The average IQ displacement as a result of the eugenic and non-eugenic components will be the sum of the integral of the IQ obtaining over the several regions, divided by the cumulative total population representing these areas. Identifying the average IQ values for the areas A, B, and C by A1, B1, and C1, and the integrated total population contributions by A2, B2, and C2, we may determine the average IQ for the distribution.

The simplest case is for area C. In this instance, the average IQ contribution C1 is determined by integrating equation (3), $Q(X)$, between the lower limit XL and the top of the distribution. Here X represents the normalized IQ, with mean zero and standard deviation of 1.0. This may be simplified by breaking it into two parts, corresponding to equations (5) and (6), as shown in equation (7) below. In order to obtain the total child population for normalization, $G(X)$ is used, representing simply the upper boundary of the area. This integral can be similarly broken into two parts, and the integral C2 defined by using equations (4), (5), and (6). The contributions C1 and C2 are defined below:

$$(7) \quad C1 = \int_{XL}^{\infty} Q(X) * dX = \text{PHI}(X) \Big|_{XL}^{\infty} + a * \text{GAM}(X) \Big|_{XL}^{\infty}$$

$$(8) \quad C2 = \int_{XL}^{\infty} G(X) * dX = \text{CUM}(X) \Big|_{XL}^{\infty} + a * \text{PHI}(X) \Big|_{XL}^{\infty}$$

where XL is the eligibility threshold.

The equations for B1 and B2 are similarly found. These quantities represent those eligible but not participating. A multiplicative constant is used to represent the fact that not all participate, and the upper and lower limits are different for this group as shown. These equations are:

$$(9) \quad B1 = (1-q) \int_{-\infty}^{XL} Q(X) * dX = (1-q) \left[\text{PHI}(X) \Big|_{-\infty}^{XL} + a * \text{GAM}(X) \Big|_{-\infty}^{XL} \right]$$

$$(10) \quad B2 = (1-q) \int_{-\infty}^{XL} G(X) * dX = (1-q) \left[\text{CUM}(X) \Big|_{-\infty}^{XL} + a * \text{PHI}(X) \Big|_{-\infty}^{XL} \right]$$

where q is the fraction of those eligible who participate.

In the case of the eugenic cohort, the derivation is more complex. Here it is assumed that the average desired is the average of the donor and eugenic person, giving the factor of q/2 in equation (11). The first term is the average over the eugenic cohort, and proceeds much as before. In the case of the donor cohort, however, the number of contributors must just equal the number of births in the eugenic cohort. The first order integral, PHI, is therefore adjusted by multiplying by the area of the eugenic cohort and dividing by the area representing the donor cohort. A2, the normalizing area, is simply related to the population, since it assumed here that the eugenic population participates at the replacement level and is not influenced by the IQ/birth-rate slope:

$$(11) \quad A1 = \frac{q}{2} \left[\text{PHI}(X) \Big|_{-\infty}^{XL} + \frac{\text{CUM}(X) \Big|_{-\infty}^{XL} * \text{PHI}(X) \Big|_{XH}^{\infty}}{\text{CUM}(X) \Big|_{XH}^{\infty}} \right]$$

$$(12) \quad A2 = q * \text{CUM}(X) \Big|_{-\infty}^{XL}$$

where XH is the lower threshold cutoff IQ for the donor

population.

The final value of the average IQ change, $\bar{IQ}$, as a result of this process is:

$$(13) \quad \bar{IQ} = H * \frac{(A1 + B1 + C1)}{(A2 + B2 + C2)}$$

where H is the heritability. The expression may be greatly simplified by combining terms and use of the following relationships:

$$(14) \quad \text{CUM}(-\infty) = 0; \quad \text{CUM}(\infty) = 1; \quad \text{CUM}(X) = 1 - \text{CUM}(-X);$$

$$(15) \quad \text{PHI}(-\infty) = 0; \quad \text{PHI}(\infty) = 0; \quad \text{PHI}(X) = \text{PHI}(-X);$$

$$(16) \quad \text{GAM}(-\infty) = 0; \quad \text{GAM}(\infty) = 1; \quad \text{GAM}(X) = 1 - \text{GAM}(-X).$$

The resulting expression is given by:

$$(17) \quad \bar{IQ} = H * \left[\frac{a * (1 - q * \text{GAM}(XL)) - \frac{q}{2} * \left(\text{PHI}(XL) + \frac{\text{CUM}(XL)}{\text{CUM}(-XH)} \text{PHI}(XH) \right)}{1 - a * q * \text{PHI}(XL)} \right]$$

where, to recapitulate:

a is the slope of the IQ/birth-rate relationship, each variable normalized to the standard deviation of the IQ distribution.

q is the fraction below the eligibility threshold participating.

XL is the eligibility IQ threshold.

XH is the donor IQ threshold.

This is the average normalized IQ shift per generation. Multiplying by the standard deviation in IQ gives the change in IQ per generation.

REFERENCES

This bibliography is brief. While the total list of items reviewed in the preparation was much larger, most were historical or descriptive and had only marginal impact upon the argument. Some of these latter references are included which provide good background material in any case. These are indicated by a single asterisk. Others, marked with double asterisks, are included as references in rebuttal to the present work.

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BOOK REVIEW

THE ORIGINAL SIN**Incest and Its Meaning**

W. Arens

Oxford University Press

Incest and its prohibition have been discussed by the masters of the natural and social sciences, most notably Darwin, Freud, Frazer, Durkheim, Marx, and Lévi-Strauss. For Freud, incest was a historical or contemporary fantasy rather than a reality; for the others, the origin of the incest *taboo*, rather than incest itself, was the primary focus. Indeed, contemporary thinking about the word incest has become confused: "incest" can mean the act of sexual intercourse between relations, or alternately, it may even obscurely connote its very antithesis – the prohibition of incest. Challenging the view that the incest taboo developed in response to the act or desire, *The Original Sin* directly and systematically confronts the source and meaning of incest to arrive at a provocative new conclusion.

This study revitalizes classic yet neglected arguments to demonstrate the *avoidance* of incest as a feature of precultural society. Looking beyond the incest taboo to the act itself, Professor Arens unearths the disturbing roots of incest and then shows how the very deed functions as a unique human social mechanism. This premise leads to an unsettling yet unavoidable conclusion: that incest, rather than the prohibition, is the cultural invention and mark of our species.

Moving from the general to the particular, Arens examines the varieties and forms of incest, drawing from biological and anthropological evidence as well as from his own research among the Shilluk of the Southern Sudan. Arens extracts what he believes has long lain hidden in the human consciousness and questions those primal tenets of human behavior. Reclassifying incest as a cultural invention rather than a suppressed innate tendency, *The Original Sin* fills the anthropological

lacuna on this neglected subject with a startling, revisionary view of human nature itself.

ADDENDUM

Volume XXX, Nos. 1 & 2

Reference addendum *Mankind Quarterly* Vol. XXX, No. 1 & 2 "Sex Differences in Criminality" by Lee Ellis. Pages 31-37. The additional references to this article will appear in *Mankind Quarterly* Vol. XXX, No. 4.

ERRATA

Volume XXX Nos 1 & 2

Can a Mathematician be a Social Scientist? by J.W. Jamieson, Institute for the Study of Man, Washington D.C.

Due to typesetting errors the following amendments are necessary:

Page 75 last paragraph. Instead of "Rothman held a Ph.D. in psychology from Harvard, while Snyderman was a professor at Smith College" please read "Snyderman holds a Ph.D. in psychology from Harvard, while Rothman is a professor at Smith College."

Page 76, first paragraph. Line 4, after "indicated that" please insert "heritability played a role in determining IQ among American whites while a majority expressed..." The sentence should therefore read: "An overwhelming 94% of these respondents indicated that heritability played a role in determining IQ among American whites while a majority expressed a belief in the Shockley hypothesis, namely that genetic factors play a major role in determining human personality and intelligence."

Page 79, line 7 from bottom of text: delete the last word "by". The sentence should therefore read: "Instead, they selected his references to black and minority problems, ignored the ample and unbiased documentation with which he backed all his statements, and on the basis of this selective reporting "raised the dreaded word 'racism'," as Royster puts it."

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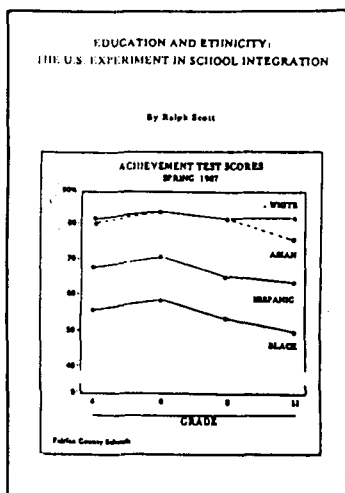
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EDUCATION AND ETHNICITY: The U.S. Experiment in School Education

By Dr. Ralph Scott
Director, Educational Clinic, University of Northern Iowa

PROMOTING EDUCATIONAL DISADVANTAGE: A NEW DILEMMA FOR AMERICAN BLACKS



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"Push-Through" Educational Programs

It is perplexing that circumstances have worsened for literally millions of minority youths during a period which has witnessed the burgeoning of special programs designed to help them. For more than three decades the entire structure of U.S. education has been dramatically reshaped. However, as U.S. schools become racially 'balanced,' educators were forced to deal with large ethnic achievement gaps at the high school level. It is not uncommon, for example, for a tenth grade student to have trouble reading a third grade textbook while sitting beside classmates capable of college work. Typically, ability grouping was abolished, and classrooms and instructional groupings were racially balanced. Other race-conscious intervention measures followed: informal quotas on student discipline, on grading practices and in composition of 'special' classrooms. Ethnic quotas on discipline and suspensions have forced teachers to tolerate behavior which is most efficaciously curbed during the formative years. Racial quotas for exceptional students have radically altered what is meant by the terms 'mentally retarded,' 'gifted' and 'learning disabled.' Uncritical promotions have led to unacceptably high failure rates in high school and universities. The sensitive racial topics considered throughout this book are intended to promote rethinking of basic educational strategies which have proven to be harmful for both black and white students alike.

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